

# Nature *Magazine*

VOLUME 45

NUMBER 2



FEBRUARY, 1951

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# New Boom Towns in America

Your Income Depends Upon Where  
You Live says Author

**CLEARWATER, FLORIDA.** The amount of money you earn at your job or from your business does not depend entirely upon your ability or even upon the kind of job or enterprise you're in, says Norman D. Ford, founder and first president of the famous Globe Trotters Club. It also depends upon where you live.

The biggest opportunities are in the boom areas, he says, where industry is growing and there's a big demand for new workers and for new, small businesses.

Today, says Ford, who has just completed a survey of the United States to learn which are the boom towns of the 1950's, there are about a hundred communities all over America which are beginning to show the signs of a coming boom. These are certain towns and cities along the Atlantic Seaboard, in Georgia, Florida, the North Carolina highlands, in Mississippi, Alabama, Louisiana, Oklahoma, Texas, Colorado, the Far West, California, the Pacific Northwest, Alaska, etc.

These are the towns where it's easier to get a good job, with good pay, and with the best chances in the country for swift promotion, whether you're 20 or 50. These are also the towns where you can start a small business and grow fast as the boom pours in more purchasing power to boost your sales and bring more profits.

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Read this story of a city man who  
gained financial independence in  
3 years of weekend fun in the  
country

Some hard work with hammer, nails, paint brush, and the other tools men like to wield on their days off from the job, converted a neglected country home — bought at a bargain price by a city civil service worker — into a 2-acre country estate, worth 4 times more. Total time: about a hundred weekends over a 3 year period. Outside help: some assistance from his two teen-age sons and a few major repairs by local contractors.

Now he lives in the country all year round and spends an hour commuting to his city job. Working weekends in the summer on his bit of land, he cuts his living costs, and he also sells enough surplus strawberries, apples, pears, and peaches to earn over a thousand more a year. With his extra income, and lower living costs of the country, and the security of his country home, he has financial independence.

The stories of thousands of other men who won security in the country inspired Fred Tyler to write his new book on how you can own your home in the country and make it pay for itself.

Fred Tyler proves over and over again that whether you want to commute to a city job or be your own boss in the country, you can live better, enjoy yourself more, earn more, and bring a good, clean life to you and your family.

His new book tells you how to buy a country home almost on a shoestring and make it worth 2, 3, even 4 times what it cost you. He shows how you, like thousands of others, can turn your surplus land into a profitable spare time or weekend business. He proves again and again that whether you farm, open a shop, an office, or sell a service, you can make a mighty comfortable living in the country... doing the things you always wanted to do... and gaining the security so few people in the city ever find.

Honestly — ask yourself: Are you living the kind of life you'd like to? Are you frittering away your weekends? Or are you doing the simple things necessary to win security for you and your family?

Send today for Fred Tyler's **Plan for Independence**. 15 fact-filled chapters for only \$1.

# RETIREMENT—How Much Income Do You Need?

—from "The Mutual Investor"

Many a person has planned to retire in recent years, only to find that his income wasn't enough to support him when the time came, due to increases in cost of living.

But here's a silver lining: some recent studies have shown, in dollars and cents, how much less an individual or a family needs when retired than when the breadwinner is still going to work. It's really surprising.

For example, Norman D. Ford, in a book entitled "Retire Young and Start Living," takes a family of four people living in the city on a moderate income. He then shows, in figures, that the same family, living on a retirement estate, could get along with about the same comforts (although with more work at home) on about half that amount.

Norman Ford's

"Retire Young and Start Living"

is one of the three book-

lets in his 3-

unit retire-

ment kit. The

other two are

"How to Earn a

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"Lands in the

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pon to order.

# WHERE DO YOU WANT TO GO?

France? Brazil? West Indies?  
Hawaii? Canada?

Read what the Christian Science Monitor says  
about a new way to travel that sometimes  
costs 1/3 to 1/2 less.

By the travel editor of *The Christian Science Monitor*: Many fascinating travel booklets pass over this desk in the course of a year but the one that arrived the other day so interested this department that it cost the office several hours of work in order that we might absorb its content. The booklet is entitled, "Travel Routes Around the World" and is the traveler's directory to passenger-carrying freighters and liners. In no time at all you find yourself far out to sea cruising along under tropical skies without a care in the world. You find yourself looking at strange ports and taking land tours to those places you long have read about. Most interesting of the vast listings of ships are the freighters which carry a limited number of passengers in quarters comparable to the luxury offered in the so-called big cruise ships which devote most of their space to passengers.

The booklet first of all answers the question: What is a freighter? The modern freighter, says the booklet, ranks with the de luxe passenger vessels so far as comforts and accommodations are concerned.

## LARGE ROOMS WITH BEDS

It is important to realize that in most cases today, freighter passengers are considered first-class passengers, although the rates charged are generally on a par with either cabin or tourist class fares. Most cabin-carrying freighters, to quote the booklet, have their private bath and shower, and these cabins offer beds, not bunks. The rooms are generally larger than equivalent accommodations aboard passenger ships, and the cabin of a modern freighter is sometimes even twice as large as first-class cabins on some of the older passenger ships. It goes without saying that your room is on the outside and amidships, the most expensive of all locations, for which you are usually charged a premium over the advertised minimum fares on passenger ships.

This booklet points out that it is frequently astonishing how low freighter fares are as compared with passenger ship fares; for example, less than one-half of the passenger ship fare to California is the amount asked on freighters. On most of the longer runs, the difference in favor of the freighters is regularly from a third to half of the passenger ship fare.

## SERVICE AND MEALS RATED EXCELLENT

Service and meals on a freighter leave little to be desired. You will be treated with consideration. Stewards will go out of their way to make your voyage pleasant. On ships with East Indian stewards you will be waited on almost hand and foot in a manner that is completely unknown to Americans and most Europeans.

Foreign ships offer their own specialties, says the booklet. Thus vessels in the East India trade serve Rikatele (or King's Table), the East Indian dish which can run to as many as 50 different courses. Scandinavian ships serve smorgasbord every day, and some of their desserts (like strawberries smothered in a huge bowl of whipped cream) are never forgotten. Another feature of freighter travel is its informality. No formal clothes are needed. Sport clothes are enough.

Other valuable information such as how to tip, shipboard activities and costs are covered in the booklet, "Travel Routes Around the World."

Some of the trips listed include a trip to England for \$160, a 12 day Caribbean cruise for \$240, or a leisurely three-month Mediterranean voyage for \$500.

The booklet is published by Harian Publications, Greenlawn, New York, and may be obtained by sending to the publisher.

So, when it arrives, all you need to do is sit down and take your choice. The booklet lists literally hundreds of ocean trips.

\$1 sends you this up-to-date guide plus two other guides:

1. **FREIGHTER LIFE.** Plenty of photos. "Bound to set you a-freighting," says an enthusiastic travel writer.
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Mention NATURE MAGAZINE when answering advertisements

# Nature in Print

By PAUL H. OEHSER

AT THE risk of stealing space from the books to be considered below, I must explain the appearance of the strange name at the head of this column. At the time this is written, a fortnight before Christmas, my long-time friend Howard Zahniser is too ill in George Washington University Hospital to be allowed one of the things he most enjoys — writing. Perhaps there is another activity he enjoys more — reading. When he can combine the two, as one must do in reviewing books, his pleasure is unbounded. He has asked me to “guest-conduct,” and I have consented, first because I am ever disinclined to refuse a friend’s reasonable request, and secondly because I feel that however badly I may botch the job it will be better than a blank page. This latter may be presumptuous.

And here I want to seize the chance, which it has taken the unhappy circumstances of an illness to bring about, to laud the king in his own castle and remind readers of *Nature in Print* of what a treat is theirs in Zahniser’s monthly essay. It began, you may remember, back in 1935 with a series of *Nature* articles written around the months of the year or around eminent *Nature* writers and their work. Gradually it broadened in scope. For a few months the page was called *Indoors and Out*; but finally the title *Nature in Print* was settled on, and it became almost entirely a discussion of current *Nature* writing and writers, all composed in Zahniser’s delightfully personalized style and with his gracious touch. Almost without a break, he has continued the page for these 15 and more years, and we hope he will soon be back.

Zahniser’s philosophy of book reviewing is, I think, a highly appropriate one for this magazine. His aim has been to help people enjoy and learn about *Nature* by reading about it. He well knows that every book has its flaws, that there are few books printed that one can wholeheartedly and unreservedly praise in every detail. So, he says, rather than harp on the flaws, why not point out the good things in the books and leave the problem of literary reform to other journals? I remember a song from an old phonograph record of my youth with the refrain, “If you can’t say something good, don’t say nothing at all.” That, it seems to me, has been the motto of *Nature in Print*. Such an attitude is of the very essence of a fine discrimination. I am reminded also of a passage in that remarkable book *Lavengro*, by George Borrow, who says: “I never could understand why reviews were instituted; works of merit do not require to be reviewed, they speak for themselves; works of no merit at all will die of themselves, they require no killing.” In that spirit Zahniser has eschewed reviews in the usual sense but has endeavored to pass on to his readers some of his own enthusiasms, girt round about with the overtones of his wide knowledge of *Nature*, literature, and people. Thereby he has made this department a thing of more than mensal interest. It has been, indeed, *nature in print*. All of us, his readers, are fortunate, and we wish him a full recovery and a speedy return to this page. We also wish him, on the 25th of this month of February, 1952, many happy returns on his 46th birthday.

We are living in days when cosmic forces predominate our thinking. Perhaps that is why such a book as Rachel Carson’s *The Sea Around Us* has caught popular attention so emphatically, for Miss Carson’s subject is truly an elemental and compelling one. The two books that Howard Zahniser suggested as this month’s *Nature in Print* feature are lesser in physical scope than Miss Carson’s, being concerned with but small portions of the sea, but they are interesting additions to the current marine literature. They too are elemental and compelling; they treat of forces that man sometimes only dimly comprehends but of which he is part and parcel, forces that have been accumulating since the beginning of time.

*The Bay* is Chesapeake Bay. The author, Gilbert Klingel, is a biologist, a diver, and a writer. He begins by saying that the Chesapeake is “one of the most remarkable bodies of water in the world and the lives of many of the creatures that have their being in its depths are little short of marvelous.” That is an understatement. Mr. Klingel has explored the Bay, top and bottom, and he writes in detail of the marvels he has observed first-

hand — the fishes, the jellyfish, the barnacles, the crabs, the marine worms, the ospreys and other birds, the seaweed, the sand, and many more. Particularly exciting are his experiments with the “bentharium,” an apparatus which he and his associates devised for underwater exploration and in which two or three men could safely descend to the bottom of the Bay for leisurely observation and photography, without the physical discomforts of helmet-diving. The pains taken to build this ingenious equipment were indeed rewarding, and the results thereof pervaded the book.

Like a sermon, Mr. Klingel’s fine descriptions and scientific facts concerning submarine habits and habitat all lead finally to some solid philosophy pertaining to our world. “Every thing

in nature,” he says, “carries within itself a full, if small, reflection of the sum of nature. We are all of one essence; and, except for size and complexity, there is little difference between a flea and an elephant. . . . A tree lives; it dies. It surrenders its leaves and twigs and branches to the soil that nourished it; its limbs return to earth and become soft brown loam and a home for burrowing grubs and hard-winged beetles. . . . The song of some courting bird may be the distilled essence of some lowly grub which would never have lived if a tree. . . . had not fallen and become a moldering log.” These simple ecological conclusions, Emersonian to a degree, are not new; but they cannot be too often stated, for in them lies the key to our understanding of the complete and inseparable unity of *Nature*. Mr. Klingel came to his conclusions after a thorough study of Chesapeake Bay, but, as he says, “one can start with any object and find in it some example on which to base a considerable philosophy . . . the beginning point may be anywhere.”

Union Bay is 3000 miles from the Chesapeake. Harry W. Higman and Earl J. Larrison (whose previous book *Pilchuck: The Life of a Mountain* was discussed here in October, 1949) have merged themselves into one author to write about the life of a city marsh that is situated so close to Seattle, Washington, that the shouts of the football fans in the university stadium may be easily (we presume) picked up by the sensitive ears of the mink, muskrat, otter, beaver, and weasel that live around the bay. Here, in the midst of people, boats, machines, and other disturbing conditions, a typical wildlife community exists, finds

## The Truce

By ELEANOR THAYER

Now, white-faced hornet, understand me, please!

Not friend nor foe — If I should hesitate,

Wee artisan, I beg you be at ease

And for a time respect my neutral state.

Forthright, industrious one, I plead my case.

Thinks: *Layer by layer he builds his paper walls*

*Expertly, materials of the crudest kind —*

*For baby hornets compact, little stalls . . .*

Forthright, industrious one, I plead my case.

Let me advance a bit for learning’s sake

Until we two consider, face to face,

And some conclusion one of us can make.

(That bristling back, those cold, unfriendly stares!

It’s time I went about my own affairs.)

its food, fights its enemies and the weather, and reproduces. The authors of *Union Bay* believe, salutarily, that man cannot rightfully be left out of this picture. "For a long period it was the fashion," they remark, "to eliminate man from the typical wildlife story. The animals which were described lived their lives in their native habitats, unmolested and uninfluenced by people. But now, in the marsh, in the mountains, on the pampas of South America, in the forests of Canada, and in nearly all hitherto remote places, conditions have changed. Men hunt everywhere. Other activities, such as drainage, filling, tree-cutting, building . . . directly and sometimes devastatingly affect wildlife. To leave man out of the consideration of wildlife is to ignore one of the most important factors." Certainly, in *Union Bay*, man is not omitted. The book shows how man and marsh can come to terms, although inevitably it seems with the advantage on the side of man.

*Union Bay* has its basis in many long hours of close and fascinating field studies, hundreds of canoe trips around the bay in all kinds of weather, and a thorough knowledge of biology. There are many intimate and rare wildlife experiences recorded, to delight all who have a feeling for such matters. Like Mr. Klingel's book on the Chesapeake, *Union Bay* is a fine sermon in ecology and in conservation principles, and sermons should be listened to and pondered over. Both books, in fact, hold much food for reflection and should go on our bookshelves with William Beebe's *Book of Bays*, Rachel Carson's *Under the Sea Wind*, Sally Carrighar's *One Day at Teton Marsh*, and Sidney Lanier's *The Marshes of Glynn*, from which last-named poem all our ministers of the wonders of the deep may take inexhaustible texts.

\* \* \*

*The Bay:* By Gilbert C. Klingel. New York: Dodd, Mead & Co. 1951. 278 pp. (5½ by 8¼ in.), with title-page and 17 chapter-head drawings by Natalie Harlan Davis. \$4.

*Union Bay: The Life of a City Marsh.* By Harry W. Higman and Earl J. Larri-son. Seattle: University of Washington Press. 1951. 315 pp. (5¾ by 8½ in.), with 37 drawings by Edmund J. Sawyer. \$4.

### Instinct

*The Study of Instinct.* By N. Tinbergen. New York. 1951. Oxford University Press. 228 pages. \$7.00.

Based upon and extended from a series of lectures delivered under the auspices of the American Museum of Natural History and Columbia University, this book is an introduction to the biological study of innate behavior. The chief audience of the book is among zoology students, but the approach is such that it should also

be of great value and interest to both psychologists and physiologists, as well as to anyone interested in the fascinating subject of animal behavior.

### Clever Coyote

*The Clever Coyote.* By Stanley P. Young and Hartley H. T. Jackson. Harrisburg, Pa. 1951. The Stackpole Company. 411, pages. Illustrated in black and white, with a color frontispiece by Walter A. Weber. \$6.50.

That the coyote has been able to survive with the hand of man usually turned against it is a tribute to its cleverness. It has even been able to extend its range. As much a part of the West as the cowboy of a later day, this animal of the wilderness has cast its lot with civilization and, somehow, survived. In this book, the last and most complete word on the coyote, two distinguished mammalogists collaborate. They cover the animal's distribution, habits and characteristics, parasites and diseases, economic status, hunting and control, and its place among mammals. Extensive references and a bibliography are provided. This is another in the series of Wildlife Management Institute publications.

### Social Anthropology

*Elements of Social Anthropology.* By Raymond Firth. New York. 1951. The Philosophical Library. 257 pages. Illustrated. \$5.75.

In this book the author, a social anthropologist, gives part of his framework of ideas for studying and understanding the variety of ways in which men think and act in social life. The book is based upon a series of lectures given at the University of Birmingham, England. Drawing upon his own experiences and other source material, the author compares values and patterns of conduct in the Western world with those in "primitive," technically underdeveloped societies. As a whole the book represents an objective analysis of modern problems of human relations.

### Caribbean Trees

*Flowering Trees of the Caribbean.* Thirty paintings by Bernard and Harriet Pertchik, with an introduction by William C. White. New York. 1951. Rhinehart and Company. 125 pages. \$10.00.

This beautiful book presents in superb color twenty-nine paintings of flowering trees found in the Caribbean region. The artists covered a wide area, from the Antilles to South America, making their studies on the ground. The illustrations are supplemented by an interesting and informative text that includes the botanical story of each of the trees, and the folklore and legend that has grown up around many of them.

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and  
Devoted to the Practical Conservation of the Great Natural Resources of America

## IN THIS ISSUE

February, 1952

Vol. 45, No. 2

Nature in Print.....	Paul H. Oehser	58
The Truce (Poem).....	Eleanor Thayer	58
Contents Noted.....	R.W.W.	63
The Three Abundances.....	Mabel Irene Huggins	65
A Bird that Walks on Water.....	W. T. Miller	69
Composition Matter (Poem).....	Ray Romine	71
A Mineral that Flows.....	Eugene W. Nelson	72
The Bat (Poem).....	Daniel Smythe	74
The Bristlecone Pine.....	Donald Culross Peattie	75
Don't Pick Me (Puzzle)		
	Agnes Choate Wonson	76
The Florida Crocodile		
	E. Ross Allen and Wilfred T. Neill	77
Driftwood (Poem).....	Cosette Middleton	80
Bats Are Friendly.....	Ernest P. Walker	81
A Water Lily Blooms.....	Hugo H. Schroder	87
An Open Mind (Editorial).....		89
Glastonbury Thorn Maintains Tradition.....	E. John Long	90
Snake in the Grass (Poem)		
	Louise Mayers Meredith	91
Highland Trees and Jungle		
	Magic..... Henry S. Kernan	92
A Bird-Seed Hunt.....	Joel Miles	96
Blue Damsel Fly (Poem)		
	Belle Chapman Morrill	97
Thomas Pennant.....	W. L. McAtee	98
Light-Time and Celestial Distances.....	Isabel M. Lewis	99
Seven Stars (Poem).....	Helen Jones	100
Ptarmigan Tactics.....	Warren B. Hamilton	101
The School Page.....	E. Laurence Palmer	102
Camera Trails.....	Edna Hoffman Evans	104
Under the Microscope.....	Julian D. Corrington	110

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PHOTO BY JOHN H. ANDERSON

## IN THE CANNON'S MOUTH

By JOHN B. BEHREND

For a long time I had been hoping to find a crested flycatcher's nest. Then, early in June, when walking through Oak Woods Cemetery, Chicago, I noticed a bird, which I was sure was a crested flycatcher, fly out of the open end of the barrel of one of the cannon's that flanked a large plot where Confederate soldiers were buried. The hole was too small, for my hand, so I found a stick and raked out some green grass, rabbit fur, bits of paper, and dry grasses. Apparently a nest was in the course of construction and I decided to visit the place again.

About a week later I returned. Peering into the cannon, I was forced to duck as a bird rushed out. It flew into a nearby chestnut tree, slipped through the branches to the other side of the tree, and then flew into an adjacent elm. I watched it just long enough to be sure that it was a crested flycatcher, and then went back to make further observations on the nest within the cannon. With a short stick I was able to find that the nest-building had gone on, but I was careful not to disturb the nest seriously. I did find a piece of dried snake skin, which these birds are said always to use.

With a pocket mirror I tried to manipulate so that I could see the nest, and maybe the eggs, within, but was able to see little more than an outline of the nest.

### Waterfowl Program

With the increase in the percentage of the income from the sale of the duck stamp that may be applied to enforcement of the waterfowl regulations, the Fish and Wildlife Service has announced an expanded program of enforcement and management of these resources. Director Albert M. Day estimates that the illegal kill of ducks and geese amounts to about twenty percent of the legal kill. With an added \$200,000 available to increase the enforcement staff and to staff game management areas hitherto understaffed, a marked reduction in this loss is anticipated. Dr. Joseph P. Linduska has been named to head the enlarged Branch of Game Management.

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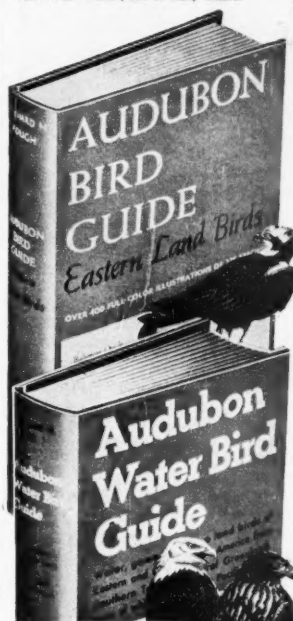
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As they make leaf prints Camp Fire Girls learn the identifying shapes and marks of various kinds of leaves. During the week of March 16-22, the country's 369,651 Camp Fire Girls will observe the forty-second anniversary of their organization, founded in 1910 by Dr. Luther Halsey Gulick and a group of progressive educators.

## NATURE AND CAMP FIRE GIRLS

Whether she is seven or seventeen, a Camp Fire Girl — if asked (and she often is) — will say that camping and outdoor activities rank high on her list of favorite things-to-do. Seven-to-ten-year-old Blue Birds love to pack nosebag lunches and go on short nature hikes. Camp Fire Girls, the intermediate group of ten-to-fifteen-year-olds, think there is nothing to compare with an overnight hike when they sleep under stars and learn why that ribbon of light is called the Milky Way and how to find the big dipper and the little dipper and all the other familiar formations.

By the time a Camp Fire Girl becomes a Horizon Club member, (the senior high school group) she has a deep appreciation of the trees, the forests, the wild flowers and mammals and the birds, and she knows that as a good citizen it is her responsibility to conserve the wildlife and natural resources of the country.

In all parts of the United States Camp Fire Girls of all three age groups go camping the year round — in resident camps, group camps or day camps in the summer, and on week-ends and day hikes in the spring, fall and winter. And, of course, Nature is one of their major interests.

Susanville, California, Camp Fire Girls camp out during the summer at a nearby ranger station where they study trees and reproduce wild flowers on hand-painted pressed tiles.

Blue Birds in Reading, Pa., have a "Let's Look at the Sky" day at day camp when a counselor tells them about cloud formations and stars, helps them make

cloud notebooks and shows them how to make small telescopes from salt boxes.

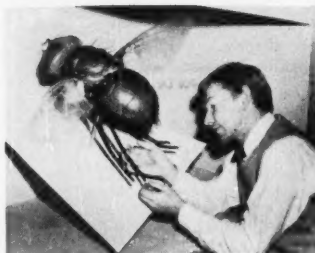
The Johnny Grass Seed conservation program in Colorado got a helping hand from Camp Fire Girls there, and the organization's members all over the country take part in Arbor Day activities of their various states.

A patrol whose objective is to encourage municipal park visitors to preserve flowers and trees and shrubs has been formed by Larchmont, N. Y., Camp Fire Girls, while in Albion, Mich., the organization's members planted 35 trees in one of the city's parks. And in Syracuse, N. Y., Camp Fire Girls campers shared in conservation and reforestation projects by planting 800 seedling pines on the camp grounds.

One of the program books written for Camp Fire Girls is *Our Land — Conservation Activities for Camp Fire Girls*. The booklet describes what conservation is and what Camp Fire Girls can do about it, and suggests many practical activities in which Camp Fire Girls can take part.

## Heads Foresters

George L. Drake of Shelton, Washington, has been elected president of the Society of American Foresters for the two-year term of 1952 and 1953. Mr. Drake was graduated in forestry at Pennsylvania State College in 1912. He served as a government forester for 18 years. In 1930 he took charge of woods and forestry operations of the Simpson Logging Company, and is a former chairman of the Society's Division of Private Forestry. Elwood L. Demmon, director of the Southeastern Forest Experiment Station at Asheville, N.C., was elected vice-president.



If flies grew to be as big as the one shown above they would be classified as "game." This one is a model of the green bottle fly, enlarged forty-six times into quite a frightening animal. The model was made by Paul Wright, formerly a technician with the American Museum of Natural history and now a sculpture student at the Cranbrook Academy of Art. Working at night for four months, and with one eye on a microscope, Mr. Wright duplicated the fly with amazing accuracy. He used balsa wood, beeswax, automobile lacquers and common pins. The fly is among the exhibits at the Cranbrook Institute of Science, Bloomfield Hills, Michigan.

## Goofy Grouse

"At Jordan Pond there is a most peculiar grouse," reports Ranger Senne of Acadia National Park in Maine to the National Park Service. "This bird was first noticed early in the fall along the road near the Jordan Pond House. At first I thought it was just another grouse, but George turned out to be no ordinary critter. As days went by I got accustomed to looking for George in his usual spot by the road, but one day he wasn't there. As I was about to drive off, I raced my engine a few times and out popped Goofy George, the gregarious grouse. It seems that the bird has taken a liking to my patrol car, especially when the engine is raced, so if he is not around, all one needs to do to have George make an appearance is to race his engine a few times. That does the trick. "This grouse is very tame and will approach the car, practically perching on the hood, and another peculiar quirk is his habit of chasing the car (on foot) down the road upon departure. Yesterday as I was sitting in the house eating lunch, I glanced up and there was George perched outside my window, looking in and smacking his lips. Wotta bird!"

## Graphology

*The Graphologist's Alphabet*. By Eric Singer. New York. 1951. The Philosophical Library. 118 pages. Drawings by Gertrude Elias. \$3.75.

With many samples of letter formation, this is a presentation of the art of graphology.

# Contents Noted

**J**UST when we arrive at a certain feeling of satisfaction about one or another phase of conservation progress, something comes along to jar us out of any complacency. We have been making slow but fairly steady progress toward the ideal of conservation commissions free from politics and animated by a basic desire to manage natural resources with some regard for posterity. This ideal, to be sure, has not anywhere been completely attained, but there has been increasing evidence, here and there, that it can be. Then comes Michigan, which has had good conservation philosophy, particularly under the leadership of the late P. J. Hoffmaster. A committee of forty-five Michigan citizens — fifteen appointed by the Governor, fifteen by the State Senate and fifteen by the House of Representatives — came forward with a recommendation that the seven-man Conservation Commission be junked and that a single director be appointed by the Governor. The recommendation frankly stated that "the move would place the responsibility for conservation functions under control of the elected governor." Only twenty members of the special committee were present when this recommendation was adopted, thirteen voting for it, seven against. Thus less than one-third of the committee have put over this idea. Michigan conservation groups are aroused and plan a fight when this proposal comes to the Legislature. Perhaps the fight will serve to focus attention on the importance of keeping politics out of management of natural resources.

**O**NE of our readers calls our attention to an Associated Press story from Washington in a sort of follow-up to the story of the death of "Howard," the whooping crane on the Aransas National Wildlife Refuge in Texas. He protests about the flip character of this story, and, we think, with good reason. The story was based upon an interview with Dr. Herbert Friedmann, curator of birds at the Smithsonian Institution, and the manner in which the story was handled illustrates why many scientists are frequently irked by the way news stories about scientific subjects are often handled. "Howard" was one of the pitifully small group of whooping cranes still alive. Here was an opportunity to tell a significant story of the virtual extirpation of a native species on the authority of a noted ornithologist. Instead, the reporter, and, apparently, the Associated Press, thought it was funny that the whooping crane should be in such a plight. If the extermination of a species is funny, then what the atomic bomb might do to the human animal is funny, too.

**B**ECAUSE the Bureau of the Budget will not give approval to one of the simple provisions of the bill to provide refuge for the few remaining Florida Key Deer, the legislation introduced by Congressman Lantaff of Florida is in a Congressional pigeon hole. And the diminutive deer continue to be the victims of

poachers, hit-and-run motorists and fire. Perhaps not more than fifty of the deer remain, but, with protection, they can be saved from extinction. Early last year the Boone and Crockett Club initiated a program of preservation as a stop-gap. Other groups assisted on a plan that was to hold the line until legislation could provide permanent protection. Now the matter is in a stalemate and the protection must be extended. The National Wildlife Federation, Washington 10, D.C., has, therefore, established The Key Deer Fund in this emergency. All contributions, however small, will be used for these deer. Contributors will be given a special certificate designed by Ed Dodd, creator of "Mark Trail," who devoted quite a bit of attention to the Key Deer in the course of the Mark Trail story.

**W**E HAVE been taken to task, and properly so, for certain parts of the note we carried here in the November, 1951, issue commenting on a U.S. Public Health Service announcement that magpies and redwing blackbirds have been found to carry the virus of sleeping sickness. We expressed doubt as to the validity of epidemiological findings in what was rather hurriedly prepared comment under much personal stress. We knew full well that it has been established that viruses are transmitted from bird to bird through the agency of mosquitoes and through parasitic insects. However, we were, apparently, moved by a desire to prevent a vendetta against magpies and redwing blackbirds by elements that are eager to seize upon any excuse to find a live target outside the legal shooting seasons. We still think that publicity of this sort is dangerous, and that any control measures that are conclusively indicated as necessary should be applied only on a scientific basis. Nevertheless we must apologize to the epidemiologists for any unintended slur we may have tossed their way.

**W**E WERE happy to see an effective pictorial layout and an excellent article by Martin Litton in *The Los Angeles Times* for last December 16 exposing the drive to invade Dinosaur National Monument. The author visited the area and listened to local opinion. He found that local people are unconcerned about the cost of Echo Park and Split Mountain dams because "the government will pay for them." And he concluded that these dams are an entering wedge for piecemeal devastation of national parks by the Bureau of Reclamation.

**M**AY we take this opportunity to thank the many readers who wrote us words of sympathy and comfort after reading our page in the December, 1951, issue. Word came from all corners of the United States. We heard from people we know through correspondence and from people who are complete strangers to us. We found that many had suffered a similar loss and drew upon their own strength in meeting it to give us encouragement. We shall ever treasure these letters and cards of sympathy. People can be wonderful. R.W.W.



All of the Three Abundances appear in this vase of carnelian and jade. Ch'ien Lung period (A.D. 1736-1795). Courtesy, The Minneapolis Institute of Arts.

**I**N RECENT years we have expressed our desire for an abundant life for all men everywhere by the formulation of the Four Freedoms. Much earlier, however, the Chinese had voiced their longings, but for themselves alone, by what they called the Three Abundances. It was felt that there were three essentials for a full life — an abundance of years, an abundance of descendants, and an abundance of promotions. In other words, to enjoy fullness of life a person should have longevity, posterity, and advancement in official position.

In characteristic fashion, the Chinese called upon Nature to provide symbols for these Three Abundances. Sometimes they are referred to as the *san ku*, the three fruits — the Buddha's hand symbolizing promotions, the pomegranate representing many descendants, and the peach signifying many years.

The first of these, Buddha's hand, *Citrus medica sacroductylus*, or the Buddha's hand citron as it is sometimes called, is a peculiar kind of inedible citrus fruit that is practically all rind. The Chinese name is *fo-shou* — *fo* meaning Buddha and *shou* meaning hand. This name has been applied because the fruit has fingerlike divisions giving it a marked resemblance to the hand of Buddha as it is usually portrayed with the index and little fingers pointing upwards.

**The Three Abundances** make up the design of this thin paper cut-out to be used as the embroidery pattern on the end of a pillow. Drawing by Margaret Whitfield.



Ma Ku, goddess of longevity, carries the Three Abundances in her fruit basket. This coral figure stands 16¾ inches high. 19th Century. Courtesy, Walker Art Center.

In South China Buddha's hand trees grow outdoors, but in North China, where the winters are cold, dwarf trees of Buddha's hand are kept inside for their decorative qualities, just as are lemons, oranges, or oleanders.

At the New Year's Festival plates or bowls of Buddha's hand citrons are placed before the shrines of the household gods and ancestors as offerings and prayers for happiness, *alias* money, inasmuch as money is supposedly necessary to secure happiness. Closely associated with this idea is the expression *chin ch'ien shou*, literally, "gold money hand." This term is used as the name of a Buddha who was a thief to get money to help the poor in a Robin Hood manner. As the Chinese say, *t'ou fu chi p'in*, "steal from the rich to succor the poor."

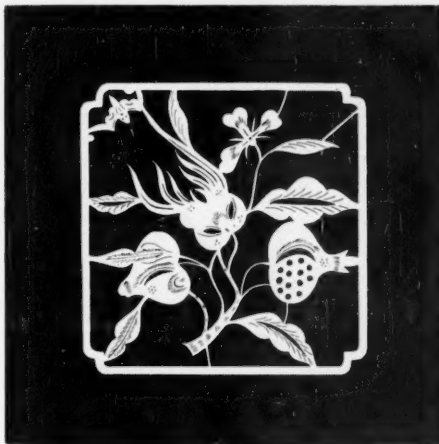
For a long time it has been the vogue to place Buddha's hand citrons in the various rooms of a home that they may scatter their fragrance, which is especially agreeable to the Chinese.

Although Buddha's hand citrons are rather expensive, they are purchased and presented to one's friends as gifts of well-wishing. As a Chinese friend of mine said, "A person does not buy Buddha's hands for oneself because a person doesn't buy his own good luck. It is luckier when it is the wish of a friend."

In modern times shows have been held for the display of Buddha's hand citrons. At such exhibitions the public may see perfect specimens of this fruit arranged in the most approved manner. Single fruits

## The Three Abundances

By MABEL IRENE HUGGINS





(Below) Supporting this pomegranate-shaped vase are buds and flowers, the whole giving a realistic effect, as it was made of red carnelian. 19th Century. Courtesy, Walker Art Center.



This handsome piece of black cross-stitch on coarse white cotton cloth shows the *san kuo*, — the peach (upper right), the Buddha's hand (lower right), and the pomegranate (lower left). The representation of the three together is the equivalent of saying, "May you have long life, many promotions, and as many male descendants as a pomegranate has seeds." American Museum of Natural History Photograph.

are placed on a supporting bed of rice or white sand in valuable porcelain bowls. Arranged thus they are suitable for use in a scholar's study, although not appropriate for guest halls. For the latter, four fruits are placed on a plate — three below and one on top.

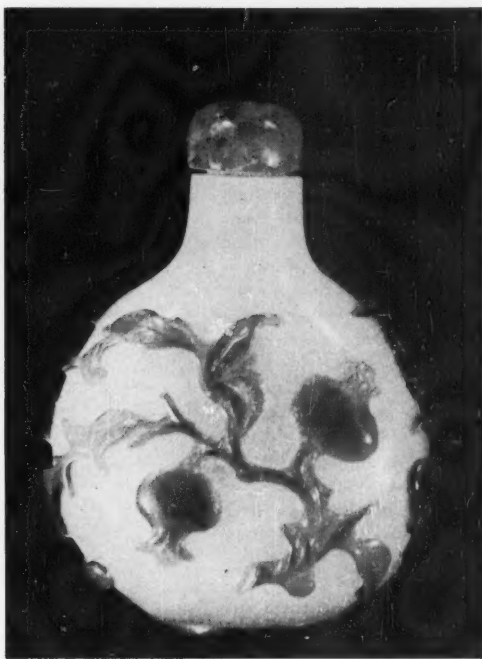
The Buddha's hand is sometimes looked upon as a symbol of wealth because it is said that the fruit has a similarity to a money-grasping hand. Under the Empire the system of official promotions carried with it the opportunity for squeeze and monetary emolument, so this fruit seems an apt emblem for this area of life.

The second of the *san kuo* is the pomegranate, *Punica granatum*, a fruit that was not native to China, but introduced from western Asia. Some historians think it was taken into China before the Christian era, while others mention the third century as the date of its introduction. However that may be, its popularity so increased that for centuries it has been cultivated as a favorite shrub. Writing in A.D. 818, the poet Po Chü-i described the surroundings of his mountain cottage. Along with tall pines, a bamboo grove, a vine-covered garden fence, flowing water, a stone bridge, a lotus pond — "the things that have all my life most pleased me" — he mentioned the red pomegranate.

Both blossoms and fruit are a delight to the Chinese. The flowers range in color from white through varying tones of pink and scarlet to dark red. Both single and double flowering forms exist.

It is of interest to note that the Chinese expression for shrapnel is *liu tan*, "pomegranate bullets," and, by prefixing the word *shou*, we have the Chinese term for hand grenade. This may recall that, in our own language, an obsolete meaning for grenade is pomegranate.

In China the names of places often hark back



The Three Abundances, in high relief of soft green, provide the decoration for this snuff bottle of cloudy white glass. On one side may be seen a spray of Buddha's hand and a peach; on the reverse, a well-executed pomegranate branch. Ch'ien Lung period (A.D. 1736-1795). Collection of Dorothy Huggins.

to some historic incident. This is true of the Pomegranate Flower Terrace of Hanyang. The story is told that a young wife, accused of giving poison to her mother-in-law, was sentenced to death. The time came for her execution and she was led out to the grounds where the axe-wielding executioner and the curious crowd awaited her. Just as the ill-fated moment drew near, her eyes lit upon a pomegranate bush with its flowers of good-luck red. With a burst of inspiration she broke off a small branch and planted it in the ground at her feet. As she did so she said, "I am innocent. May it put forth roots and grow to show that my words are true." To the amazement of all beholders, the little twig not only grew but opened its bright red blossoms. Thus the young wife's life was spared and the name of the life-saving flower became applied to this place.

As an edible fruit, the pomegranate is popular throughout China, but its usefulness does not end there. The rind is used for medicine, as are the roots also. And the flowers are utilized in the preparation of "Pomegranate Black," a dye for clothing. The chief importance of the pomegranate, however, rests on its symbolic significance. "May you have as many descendants as a pomegranate has seeds" is a highly felicitous Chinese saying.

The peach, *Amygdalus persica*, the third of this trilogy of Abundances, is supposed to have originated

in China. The success with which it is cultivated there might seem to indicate that it is a real native.

In a Chinese fruit market many varieties of peaches are available. A juicy, sweet kind that is the favorite of many Chinese is the "big leaf white." Other folk say the best sort is the *fei tao*, named from Fei Ch'eng, the place from which it comes. Amongst other well-known varieties are a red-fleshed kind called the "big turnip peach," the "honey peach," and a peculiar flattened sort with the unimaginative name of "flat peach." This last-mentioned variety is grown in the southern United States, where it is known as the *peen-to*, a name that has been brought over to us directly from the Chinese language. The *peen-to* has been used extensively in breeding work, and the Jewel peach, which is the leading variety in Florida, is descended from it.

From very early times there have been extravagant stories and legends in which the peach features. Of these ancient stories perhaps the best-known concerns the peach tree that grew in the garden of Hsi Wang Mu, the Queen Mother of the Western Paradise. This fabulous tree was said to blossom every 3000 years, after which it took another 3000 years for the fruit to ripen. The fruit was supposed to be capable of giving immortality to all who ate it. Thus, the peach is the symbol of longevity.

The peach tree has its place in the materia medica of China. The gum that exudes from the bark, the bark

itself, the peach-stone kernels, the blossoms, and the ripe fruit, all have medicinal uses for quite a diversity of ailments.

The wood and branches of peach trees are credited with magical powers. Taoist priests use peach wood for the seals with which they stamp their talismans, as the wood is supposed to be able to drive out demons. This seems closely associated with the power that is thought to be in peach branches, which are used for striking fever patients in order to drive out the fever spirit. It is also connected with the peach charm — the placing of flowering peach twigs over doorways to keep evil from entering.

In the days before the present political regime, there was a tiny temple in Peking called the Spiral Peach Palace (P'an T'ao Kung), a name that was much more high-sounding than the two insignificant rooms seemed to warrant. The little temple had been dedicated to the Queen Mother of the Western Paradise, so annually on her birthday — the third day of the Third Lunar Month — it became the scene of a market fair with all its accompanying activity and gaiety. To us the chief interest in the temple is the legendary reference in its name. According to an old story, there was a peach tree that grew near the Eastern Sea. The peculiarity of the tree lay in the fact that it had a spiral branch that reached westward for thousands and thousands of miles. It extended even to the Western Paradise of the Queen Mother so that she could eat of its fruit without having to stir from her palace grounds. It is not known with certainty why the name was given to this temple.

Cake shops in Peking make steamed buns the shape of



This red carnelian vase resembles a peach-tree stump with foliage and fruit in high relief. 18th-19th Century. Courtesy, Walker Art Center.



A silversmith fashioned this ring, which he decorated with the *san kuo* hanging as pendants of blue enamel. From left to right, the Buddha's hand, the peach, and the pomegranate. Author's collection.

peaches. These are tinted with a bit of pink coloring, which produces quite a realistic effect. Just as often as unwrapped bread is seen being carried through the streets of Italy or France, plates of these peach buns, sans cellophane or waxed paper, may be seen along the streets of Peking on their way to wish long life to the recipient on his birthday. The frequency of their appearance makes us realize how thoroughly this symbolism is ingrained in the thinking of the people.

It is not only in such down-to-earth items as steamed buns that we note symbolism expressed, but also in the cultural life of the people as represented by artists and craftsmen. We do not search long until we find plenty of objects that have been decorated with the *san kuo*, the three fruits.

The porcelain industry has been a field that has made frequent use of the Three Abundances. Evidently the maker and decorator of vases, bowls, plates, teacups, and other porcelain articles knew there would be a good market for pieces painted in this design. Natural colors were not required, for there are records of bowls painted in blue with the three-fruits pattern in a consignment of porcelains to be sent to Peking for the Emperor.

Another craftsman who fashioned the Three Abundances, both individually and collectively, was the lapidary. Jade, carnelian, quartz, coral, and other natural substances were the materials upon which he worked. Although his mechanical equipment seemed exceedingly simple, he produced pieces that enhance the Chinese collections of many museums. The semblance of the three fruits may be the motif for the entire object, or they may appear as a small portion of a larger (Continued on page 106)



The mother jacana, or lily-trotter, approaches her rude nest and eggs. She is a colorful bird admirably marked to blend with the habitat in which she is to be found.

## A Bird that Walks on Water

By W. T. MILLER

NATURE has produced many surprising modifications in the beaks and feet of birds, in conformity with their different modes of life. The extreme variations are most readily noticed in water-haunting birds, where even a casual observer cannot help seeing the different shapes, especially of beaks, of duck, ibis, heron, cormorant, plover, pelican, flamingo, gull, and the like. Probably the pelican should be accounted the most peculiar and exaggerated so far as beaks are concerned. But for peculiarity of feet no other African bird approaches the brightly colored and attractive little jacana. Its feet are indeed unique in size, for from toe to heel their length is equal to the full length of the bird's entire body.

"Jacana" is the South American name given to the type species of this family, which is widespread through tropical regions. Lily-trotter, lotus-bird, and water-walker are other names often used, the first being commonly preferred in southern Africa. All of them refer either to the

bird's habitat — quiet, lily-covered lagoons and backwaters — or to its apparent ability to walk on top of the water. It is certainly astonishing to watch a lily-trotter walking easily not only on the clusters of floating water weed, but also across the open water from one lily patch to another, especially as one sees that its feet are thin and spidery and completely unwebbed. Each toe, however, is almost four inches long, so that the foot has a span of eight inches or more from front to back, and six inches from side to side. This distributes the bird's weight widely over the soft water plants, thus gathering enough support. Even in the apparently open water the long toes find two or three stems — perhaps below the surface and not visible to an observer — to give them purchase as the bird scampers across. It may sink a few inches, but its legs are bare and long like any wader's.

When faced with really open water the lily-trotter takes wing to cross it, flying only five or six feet above the sur-



The feet of the lily-trotter are unique for the size of the bird, from toe to heel equal to the full length of the bird's entire body.

**Mother bird taking up one of the youngsters. The legs of another baby may be seen dangling from under the opposite wing. She always puts two to a side, whether eggs or young.**

face with its long legs and feet hanging loosely down. It flies well in need, and then the legs are stretched stiffly backwards like a heron's, but it is usually reluctant to take flights of more than a few yards at a time. Like most waders, too, it can swim when compelled, but avoids doing so as much as possible.

There are two species of lily-trotter in South Africa — the lesser, a rather insignificant, light-chestnut bird about five inches high, and the greater, which is twice as tall and brilliantly colored. The first one is comparatively rare, but the second may be found towards the tropical region on nearly every sheltered, weed-grown stretch of water. High veld or low makes no difference. Its harsh, croaking laughter and bright plumage occur on the hyacinth-choked rivers of Zululand, the municipal reservoirs of the Transvaal, or farm dams gay with water-lilies in Rhodesia. The gay flowers are not gayer than the bird itself. Over wings and back and underparts the plumage is deep maroon, matching at a distance the purple-tinted underside of a lily-pad, so that one must look carefully to see whether a distant object is a bird or a lily-leaf upturned by the wind. The lily-trotter's breast is white, turning to bright yellow around the edges, so that as it faces one in repose it may be passed over unseen as another lily blossom. A wide black stripe covers the back of the neck and top of the head, ending in a bony frontal plate, which, like the beak, is milky blue in color. The legs are green. Altogether, the African lily-trotter is a vivid rainbow of a bird, in keeping with the colorful plants among which it lives, the pink and white and yellow water lilies, or the blue masses of water hyacinth.

This bird feeds on vegetable matter and on water-animal and insect life. Depth of water does not matter. It can go where the longer-legged large waders — herons, ibises, egrets — cannot. It is the only bird truly at home in its floating habitat. Coots and waterhens are its nearest rivals, since they also walk out on the water



weed at times. These birds are clumsy, however, compared with the lily-trotter, and need heavy tangles of weed to bear them up. They prefer either to walk out on the "solid" mud or to swim in the clear water. The lily-trotter has the in-between area to itself, and eats, sleeps, and breeds in light long-footed safety on the weak and unstable water plants.

Surely no more flimsy and perilous nest than the lily-trotter's can be made by any bird. Four eggs are laid, sometimes right on a broad lily pad, sometimes on no more than a coil of weed. There they dip and sway as wind and water move the herbage, and wavelets splash against the eggs themselves. Occasionally the bird will add a few rush stems to strengthen the chosen site, but there is no solidity and a finger's pressure may submerge the whole structure. In only one place do I know of a more substantial nest, and that appears to be a local accident. The lower reaches of some Zululand rivers are blocked with a dense surface growth of water hyacinth, among which float occasional blocks of black peat. At times these little peat islands, hardly more than a foot square, are used by the lily-

trotters, which lay their eggs on the bare damp soil. This, at least, is substantial, although still afloat, but the birds have another problem here. The rivers are deep, and they wind and twist, often in full U-bends. A wind — August and September, the breeding time, are windy months — gathers the hyacinth plants and pushes them along two stretches of river until they pack solidly at the bend. A few days later, wind from another quarter reverses the process; and on calm days the sluggish current drifts the weed beds slowly down stream. It must be difficult to keep track of one small platform of peat that is continually moving backwards and forwards along a mile of river among the crowded hyacinth plants.

The instability of the lily-trotter's nest presents another problem. How can a clutch be successfully incubated and hatched out when even the weight of the mother bird is enough to submerge them completely? The eggs, coffee colored and closely covered with black, hair-streak scrolls, have highly glossed shells and must be more than ordinarily water resistant, but even so are hardly likely to develop underwater. The true answer, however, is that the parent bird does not sit on the eggs at all. The "nest" is a convenient parking place for her eggs, no more. When she crouches over them for incubation she scoops them up with the upper section of her wings, and tucks them well away from the water against her body, two on each side, using her beak to help to get them comfortably home if necessary. The action can be clearly seen at close quarters, and I have also seen a bird, when standing upright, drop an egg from under her shoulder. She herself, when sitting, has her legs doubled so that the "knees" are level with her stumpy tail, and the feet extend the full length of her body.

The incubation period is probably about fourteen days. I have watched a nest for twelve days before the eggs hatched, but it already had the full clutch when I found it. During this time the parent does not sit closely, but leaves the eggs every half-hour or so for feeding. If alarmed, she skulks off among the reeds, head down, much like a dikkop, and if an intruder



A young lily-trotter wanders from its nest to the surface of a lily pad.

gets too near during the later stages of incubation she will try to decoy it aside by lying on the weeds and flapping her wings noisily, and seemingly helplessly, in the water, and squawking loudly.

The young birds hatch out within an hour or two after each other. As they come out the parent stands up, and puts the young birds and remaining eggs on the nest while she carries the broken shell away. Then she returns and gathers them all under her wings again. The young birds, born fully covered with down and patterned in brown and buff stripes, with white under the chin, are active from the moment they leave the shell, although clumsy because of their oversized feet. They have an instinctive preening action, stretching their tiny wings

like a small child asking to be lifted into a mother's arms. They turn to their mother as she stands on the edge of the nest; she coaxes them nearer and tucks them in upright position under her wings, still two on each side, and often with their long toes left dangling below in plain view.

So long as there are both eggs and young to deal with, the mother tucks the young birds away first and then scoops up the remaining eggs, but her division is still the same.

If the young birds are left to themselves they quickly begin to scramble among the water plants, and can swim if they happen to fall into the water. They return the moment they are called. Hatching completed, however, mother tucks them all in and walks away to any place that takes her fancy, letting her family down on lily leaf or rush pile from time to time. They grow quickly, and are capable lily-trotters in their own rights within a few days, making their way about in their watery habitat.

W. P. Pycraft, in his book, *The Courtship of Animals*, tells of one species of jacana that has an unusually flattened wing bone, and he considers it might be used as a weapon. This could be further investigated. I suggest that a bone conveniently flattened would be a great help in scooping up and tucking away eggs as our African jacana does.

★

## Composition Matter

The clouds on my horizon  
Are but things of light and shade

By RAY ROMINE

To make a better picture  
When the final print is made.

# A Mineral That "Flows"

By EUGENE W. NELSON

**F**OR MORE than twenty centuries, iron workers have used large quantities of many kinds of minerals to help them in their work of winning the iron from its ores. The metal workers call these particular minerals "fluxes." "Flux" is a word taken from the old Latin term "fluo," which means "I flow."

A "flux" — when properly mixed up with a batch of ore and heated in a furnace — reacts chemically with the ore and makes it possible to extract the pure metal at a much lower temperature than would otherwise be possible. In other words, the added mineral actually makes the purified metal separate, or "flow," from its parent ore. Because one special kind of rock is unusually effective at this fluxing operation, it was long ago given the name of "fluorspar," that is, the "spar," or "mineral," that "flows." To avoid confusion, since there are so many other minerals with the word "spar" in their names, this particular mineral is often called "fluorite" instead of "fluorspar."

In many respects, fluorspar is one of the most remarkable of all the minerals in the world. It is one of the most useful, too, although few people ever hear of it because fluorspar is mostly used in making something else, or in combination with other materials. For instance, fluorspar is the source of the fluorines, which have come into prominence lately as a preventative for tooth-decay among school-age children. Hardly a ton of open hearth steel is produced that does not account for five or six pounds of fluorspar. It is the key to cheap aluminum; it is used in producing high octane gasoline; the whole family of "freon" refrigerants stem from it; and the ceramics, optical, and abrasive industries tip their respective hats in its direction for various reasons.

Unlike most minerals of widespread commercial use, most of the fluorspar mined is quite beautiful. It is usually found as crystals, and these crystals are generally in the form of perfect cubes; like common salt crystals when seen under a magnifying glass. However, unlike the salt crystals, which are clear, the crystals of fluorspar are beautifully colored. In fact, no other mineral varies so widely in shades and tints.

Practically every known hue may be found in various samples of this one mineral. It ranges from white to dark blue, and the blue itself ranges from light azure to the deepest ultramarine. Fluorspar also may be emerald green, amethyst purple, or yellow, pink, brown, and even black. Because of its beauty and softness, prehistoric men carved fluorspar crystals into statuettes and ornaments, but the stone is really too soft and too



COURTESY BETHLEHEM STEEL COMPANY

A workman shovels a charge of fluorspar into an open hearth furnace. Fluorspar makes the "melt" become liquid at a lower temperature than otherwise would be the case, thus saving time and money.

easily scratched or marred for use in making durable jewelry.

A chemist would refer to fluorspar as "calcium fluoride," or "fluoride of lime," which, of course, is merely another way of stating that this beautiful mineral is a compound of calcium and fluorine. Fluorspar is rather widely distributed in Nature, but known commercial deposits are relatively few. Our own country rates as one of the most important producers, with fluorspar mining operations being carried on in several States. The largest producers are the mines in a small area in southern Illinois and across the Ohio River in northwestern Kentucky.

Here, some time back over the horizons of recorded history, the sedimentary deposits of this particular area were shattered by tremendous earthquakes, and cracks or faults extending deep into the earth were formed. Geologists believe that gas or water, containing appreciable amounts of hydrofluoric acid, ascended through these cracks. Coming into contact with the limestone of the region, these acid-bearing waters and gases formed vertical and horizontal deposits of fluorspar — fluoride of lime. In Greenland, the hydrofluoric acid-bearing waters apparently came into contact with alumina and soda, and so formed the only known commercial source of natural "cryolite," or sodium aluminum fluoride, which is a mineral something like fluorspar.

In the large American fluorspar mines, such as the

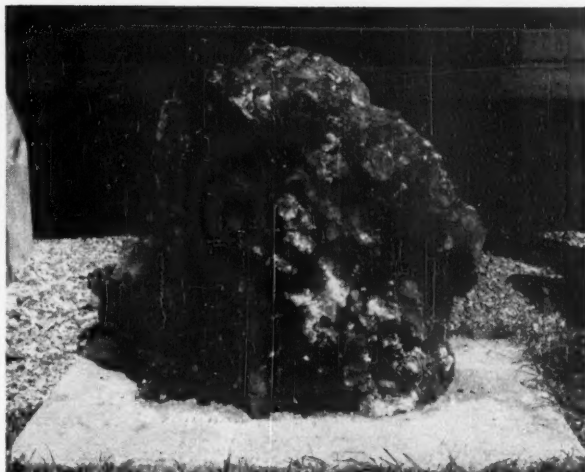
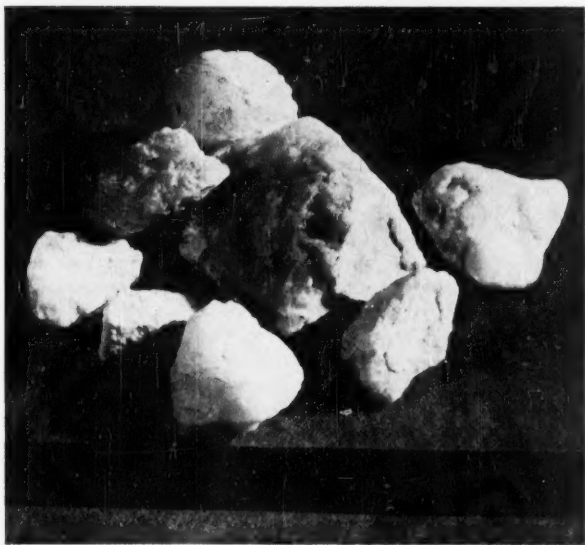
Aluminum Company of America's Fairview Mine at Rosiclare, Illinois, the mineral-bearing rock is blasted loose from the walls of the mine tunnels with dynamite. The rock loosened by the blasts is collected and hauled to the surface of the ground, where it is cleaned and sorted. This sorting process separates the rock into various grades according to the amount of pure fluorspar it contains. After grading, the material is finely crushed and packed into bags, ready for shipment. Some of the grades contain as little as 85 percent of pure fluorspar, with the remainder ordinary rock; other grades are as pure as 98 percent and even 99 percent fluorspar.

Although today fluorspar ranks as one of our most critical non-metallic minerals, it was not until the close of the Nineteenth Century that the technical value of this colorful mineral was recognized. About this time (1888), the basic open hearth furnace process for the manufacture of steel was introduced into this country, and steel makers discovered that by adding from six to eight pounds of fluorspar for every ton of metal charged into such furnaces, fuel was saved because the "melt" melted more quickly. The whole process was greatly speeded up, and a purer and better grade of steel was obtained. Yet in spite of the work this mineral does, no trace of fluorine appears in the finished steel. Thus it is that few people realize the truly important role played by steel's "silent partner."

This discovery gave such an impetus to the fluorspar industry that deposits of the colorful mineral were

**Fluorspar, as mined from the earth, is more usually in the form of small lumps like these**

COURTESY BETHLEHEM STEEL COMPANY



COURTESY ALUMINUM COMPANY OF AMERICA

**A specimen of fluorspar mined at the Fairview Mine. Practically every known hue may be found in various samples of this mineral.**

eagerly sought out and exploited. Thus it was that within a period of 22 years (1888 to 1910) the annual consumption of fluorspar in the United States alone rose from a mere 500 tons to nearly 120,000 tons!

As important as the fluorine minerals are in steel making, this industry is not absolutely dependent upon them since other "fluxes" can be substituted if necessary. In the case of the aluminum industry, however, fluorine compounds are absolutely essential. In fact, the present process for manufacturing this light, silvery metal depends upon cryolite, sodium aluminum fluoride, or some similar fluorine compound. Today, an appreciable portion of the approximately 90,000 tons of cryolite needed for our aluminum production is not natural cryolite at all. Instead, it is "synthetic cryolite," manufactured from that jack-of-many-trades, fluorspar.

Early in our present century, glazed tiles and enamels began to be developed on a commercial scale for use in the home. Fluorspar was found to play an important part in the manufacture of such products, which have since turned our kitchens and bathrooms from unsightly atrocities into the show places of which we today are so justly proud.

In making these enamels, a mixture of fluorspar and other materials is partially melted at extremely high temperatures. This mixture, or "frit," is cooled, ground, spread on a steel surface that is to be coated, and again melted to make the coating absolutely uniform and smooth. Fluorspar helps to lower the melting point of the "frit," and also helps all of the various ingredients blend together to make a smooth, opaque enamel.

Glass is one of America's leading industries and fluorspar gives certain desirable properties to a number of glass products. In electric light bulbs, lamp shades, and other lighting fixtures, the attractive opalescence is mainly due to the fluorspar that is added. In the manufacture of the various kinds of colored structural glasses for soda fountains, table tops, and ornamental trim, fluorspar is one of the most important ingredients used.

By treating fluorspar with hot concentrated sulphuric acid, the mineral is decomposed and hydrofluoric acid is obtained. Twenty years ago, the main uses for this terribly corrosive acid were for etching glass and in the manufacture of household insecticides. The acid was also used to a limited extent in laboratory work, but the total amount consumed in a year's time was extremely small.

But in 1930, when business in general was "on the ropes," the hydrofluoric business really came into its own. Air conditioning and household refrigeration were two infant industries at that time, being held back mainly because the two most readily available refrigerants were ammonia and sulphur dioxide. Both of these compounds suffered the drawback of being suffocating gases at ordinary temperatures and thus dangerous if released in any quantity through leakage.

Research, however, developed an entire series of refrigerants known commercially as the "freons," and they were based upon hydrofluoric acid. Although these freons were thus derived from one of the most destructive substances known — hydrofluoric acid — these refrigerants are colorless, odorless, non-poisonous, and, all in all, form practically the ideal refrigerant for use in homes and public places. So, once more, fluorspar scored a hit!

The uses to which both fluorspar, and the hydrofluoric acid obtained from it, are now being put are practically endless. For instance, pure, clear fluorspar crystals of high purity are much in demand by the optical industry for correcting certain lens-systems. Again, hydrofluoric acid is employed in large amounts in the manufacture of both high octane gasoline and of insecticides.

How does the United States stand with regard to supplies of this vital mineral? Before the war, we were



COURTESY LUSTRON CORPORATION

**Fluorspar in the home in the form of porcelain enamel. The ceiling, walls, and china display shelves are all of porcelain enamel, in which fluorspar is a necessary and valuable ingredient.**

using about 120,000 tons a year and geologists estimated that we had some five million tons still in the ground. In the years between 1936 and 1943, however, nearly two million tons of fluorspar were used, due to the stepped-up production of steel, aluminum, and practically all other materials for war purposes.

Our consumption of fluorspar since those hectic years has remained high, but intense exploration has located other supplies of the mineral so that today, we are sure of some 24,000,000-tons of this beautiful, useful rock underground. That is enough to last for a long, long time, and is just another example of how generous Nature was when she supplied our country with mineral wealth, not the least of which is this flowing mineral.



## The Bat

By DANIEL SMYTHE

Between the last light and the hoard  
Of shade that fills the towers of ground,  
A darting figure is restored  
To action, without word or sound.

Here on the mountains of the sky  
That draws the wisps of light behind,  
What radar steers the swift wings by  
When all the eyes of day go blind!

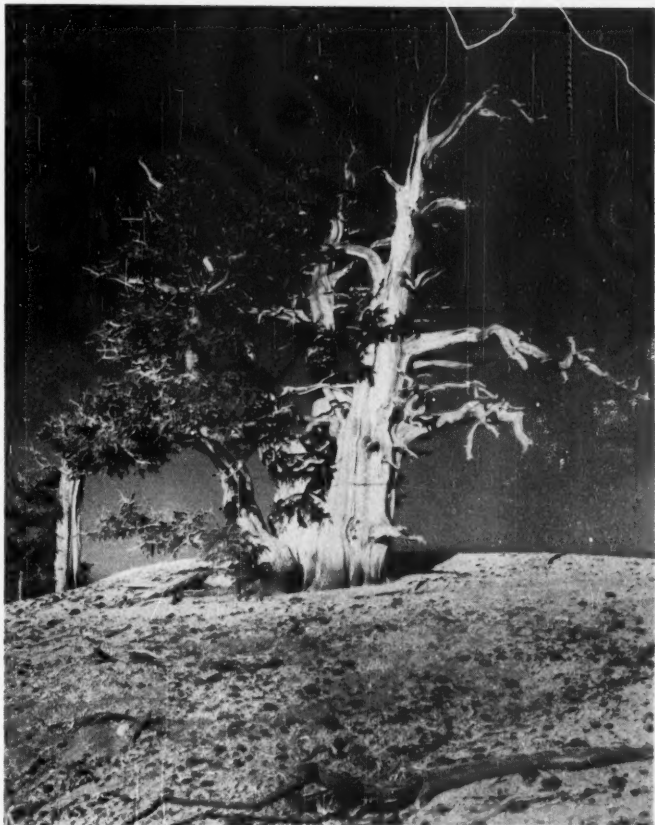
# The Bristlecone Pine

By DONALD CULROSS PEATTIE

**W**HEREVER a natural timber line occurs, throughout the mountains of the world, the trees grow more and more stunted as they approach that forest frontier, and their forms, crushed under the weight of winter's snow and ice, starved at the roots for soil and water in the brief growing season, become more and more fantastically gnarled. The vegetation seems beaten to its knees, and finally flung face down on the rock, to be stripped of upper foliage down to its white-barked limbs and whipped by the wind forever. In the Swiss Alps such growth is called the *Krummholz*, the "crooked wood." In Colorado, where there are more peaks above timber line than in any State in the Union, they call it by the name, at once poetic and accurate, of "wind timber." It begins at about 11,500 feet altitude on the north side of Colorado's Rockies, and runs up to 12,300 feet on the south sides.

For hundreds of miles wind timber follows these contours through the congested mass of Colorado's mountains. Most of it lies high above the roads and passes of the State, above the "parks" — tree-dotted mountain meadows so beloved of the summer vacationists — and so it happens that few ever see much of the bristlecone pine, that typically timberline conifer whose home lies higher than even that of the limber pine and alpine fir. On the mountain gales its winged seeds can be carried across valleys a mile deep or two, and many miles wide, to find lodgement in some distant crag. Enos Mills, the famous Rocky Mountain guide, tells of finding a timberline specimen only two feet high, growing in the most desolate situation he had ever seen, where he could not stand for the wind and could scarcely get his breath; yet it bore a single valiant cone. Probably, despite its small size, this tree was not precocious. It may well have been forty or fifty years old.

Indeed, a bristlecone pine no taller than a man may yield a record of more than 900 annual rings, and be even older than the tale they tell. For in some years the snows where it grows may not melt for several summers, and it is impossible that any growth could be made in such conditions. At best, the growing season



PHOTOGRAPH BY JOSEPH MUENCH

**This bristlecone pine, an ancient tree and only half alive, still struggles for life on a lofty eminence in the Cedar Breaks National Monument in Utah.**

is but three months in the year, and snow may fall on any summer day, while the average temperature for the year is but two degrees, Fahrenheit, above freezing. Yet there are hours of tranquil beauty in the wind timber. Long shafts of light from the setting sun still hold the wild gardens in a trance, while the valleys are already steeped in night, and lights in the mining towns are coming on. The white-crowned sparrows and solitaires pour out their music to the alpine wilderness; Clark crows come, rollicking and squawking, to pick the seeds out of the cones, and bears dig up the trees, in pursuit of marmots.

Yet, even in summer, life is hard for these trees, for the westerlies, having crossed the deserts of Utah and Nevada, carry an invisible weapon of sand, and with

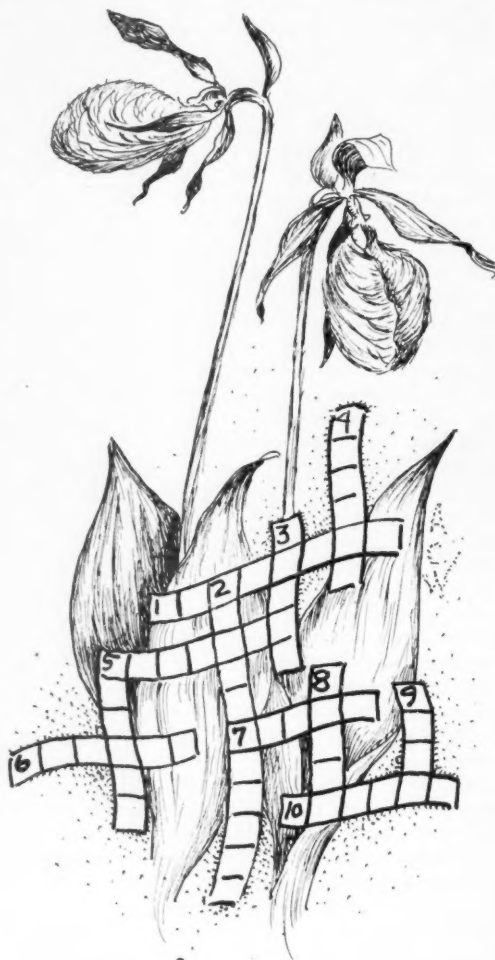
it they scour the bark right off the windward side of the trunk, flaying it to the white sinews of its sapwood. Famous examples of such bristlecones may be seen in Hoosier Pass, Colorado, at 11,542 feet. Their short stature and broken crowns give no hint of their age, but their massive trunks tell a tale of centuries of indomitable will and struggle, and their buttressed bases seem to grip the thin soil with catlike claws.

When the bristlecone can find a foothold farther down the mountains, in more sheltered spots, or when grown in cultivation, it forms a symmetrical and even luxuriant tree. Young specimens are clothed to the base in numberless branches, which themselves are completely clothed in very dark, shining needles. Each branch gives off, at sharp right angles, tiers of short, stiff branchlets, Christmas-tree fashion. At last the tree may attain a height of 40 or 50 feet, and if crowded by others will retain for some time a handsome spire-like form. But it cannot forever restrain the picturesque eccentric in its nature, and before long the symmetry is broken by the shooting out and up of long, snaggy arms.

The bristlecone pine was first collected by F. Creutzfeldt, botanist with the Pacific Railway survey through Colorado made in 1853. August 31 found the party, commanded by Captain J. S. Gunnison, in what is now Saguache County, Colorado, threading its way up over the continental divide through Cochetopa Pass by the same route taken so easily today by the motorist on state highway 14. "At our camp this evening," records Lieutenant Beckwith, the diarist of the expedition, (the valley) "is half a mile wide, covered with fine grass . . . We passed, also, a fine grove of cottonwood half a mile in length in which the deer were bounding about in every direction, even passing between our wagons, which were separated by but a few yards . . . The hills and mountains enclosing this . . . beautiful valley, vary in height from two or three hundred to twelve or fifteen hundred feet, covered with a scanty growth of pine. No mountain pass ever opened more favorably for a railroad than this. The grouse at camp are abundant and fine, as are also the trout in the creek, several having been caught this evening weighing each two pounds."

Of those pines Creutzfeldt collected a single branch, without cones. Perhaps he meant to obtain better specimens later; he had no presentiment, on that summer twilight, with the grouse booming and the deer jumping and the trout rising, of impending disaster. But on October 26, in eastern Utah, he and his commanding officer, with an escort of seven soldiers and two guides, detached themselves from the main party for exploration and were attacked by red hostiles before dawn. The "Gunnison massacre" was twelve hours over before the main party came to the scene. Gunnison's body had been pierced with fifteen arrows. After being slain the victims were mutilated; wolves had already dragged some of the bodies away and gnawed at all. Gunnison's papers and instruments were later

recovered from the Indians by the intervention of Governor Brigham Young. And eventually Creutzfeldt's specimen of the bristlecone reached Dr. John Torrey and Dr. Asa Gray, classifying plants in eastern herbariums far from the yells and knives of Utes.



## Don't Pick Me

By AGNES CHOATE WONSON

(Answer on Page 106)

Across: 1. Because it resembles an Indian's . . . . .  
5. Often called Lady's . . . . . 10. Two grow from its root.

Down: 2. Genus of this flower. 3. Grow inside sac or lip. 4. Orchis. 5. Leaves of its calyx. 8. Peduncle. 9. Month of blooming.

# The Florida Crocodile

By E. ROSS ALLEN and  
WILFRED T. NEILL

**A** LONG the southwest coast of Florida the Everglades dip gently into the sea, and a network of channels breaks the land into the Ten Thousand Islands. Here is a bewildering complexity of freshwater streams and tidal estuaries, bays, mangrove swamps, sand bars, and the tops of ancient dunes. Within this labyrinth dwells the Florida crocodile, one of the least known creatures in the United States.

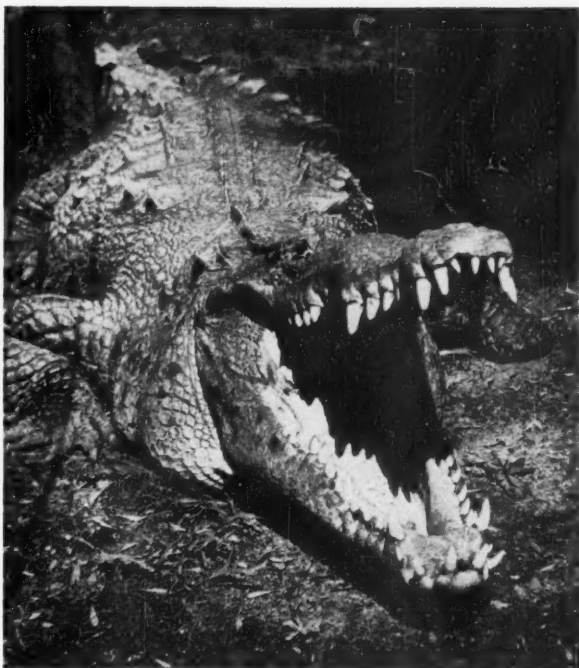
The earlier explorers of Florida apparently never saw the crocodile; or, if they did so, they left no recognizable description for posterity. True, many of the old narratives mention crocodiles, or "cocodriles," or "cocodrilos;" but in those days the name was commonly applied to the alligator, which ranged widely in the south Atlantic and Gulf States.

Probably the first person to report the occurrence of a true crocodile in Florida was the naturalist and scientist, Constantine Rafinesque. In 1822 he published the statement that there was a "sharp snout alligator" in Florida. He suggested that it probably was identical with the crocodile that had recently been discovered in Santo Domingo. Rafinesque was quite right. Today we know that this single species occurs not only on many of the islands of the West Indies, but also in Mexico, Central America, Ecuador, and Colombia, as well as in southern Florida.

Not until 1869, however, was the crocodile reported from Florida on the basis of specimens actually examined. In this year, Dr. Jeffries Wyman exhibited the head of a crocodile that had been killed in Biscayne Bay at the mouth of the Miami River (in what is now a yacht basin in the heart of Miami!) He reported that a second one had been killed at the same spot.

Strangely, the next record of the crocodile in Florida was the most northerly. C. J. Maynard, a skillful field naturalist, made a trip in 1872 from the St. John's River to the upper end of the Indian River. On this trip he killed a ten-foot crocodile in what is now Volusia County, between Lake Harney and the head of the Indian River. Presumably the reptiles followed the "intracoastal waterway" northward to this point.

In 1875, C. E. Jackson and W. T. Hornaday killed two gigantic crocodiles on the banks of Arch Creek, near what is now Miami Shores. One of these reptiles was a male measuring fifteen feet, two inches, with



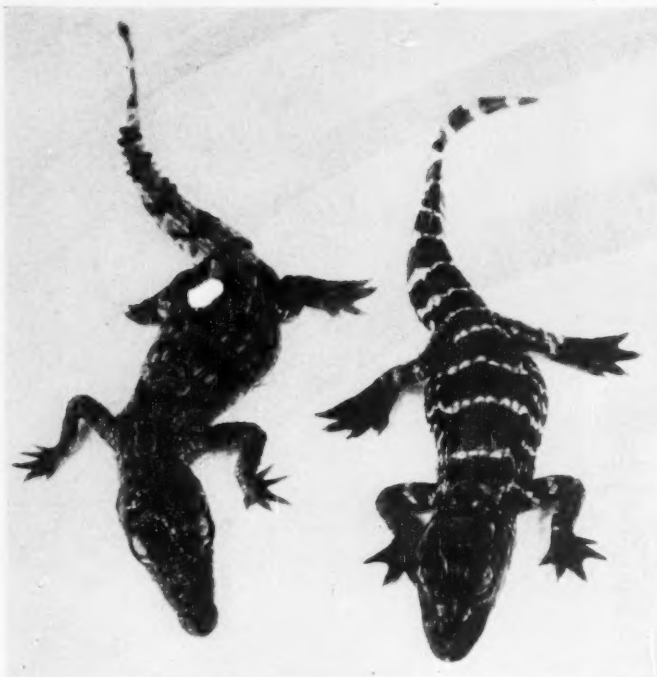
PHOTOGRAPH BY WALTER P. BROWNING

The "open countenance" of a Florida crocodile. This old male is as irascible as he looks, although wild specimens flee from man.

half a foot of its tail missing; the other was a female of ten feet, eight inches. They were killed on successive days at the same place, a "slide" or well-worn basking spot on the creek bank. At that time it was not realized that large, old crocodiles differed greatly in proportions and coloration from the smaller examples of their kind; and Hornaday was misled into describing his specimens as a "new species."

During the first two decades of the Twentieth Century, there were a few records of the crocodile from the region between Fort Lauderdale and North Miami. In 1920 a baby one was found at Palm Beach. As late as 1930, a few of the reptiles still persisted in the mangrove swamps and tidal estuaries of Florida's "Gold Coast;" in that year a Seminole Indian captured and displayed two at his curio shop on the outskirts of Miami.

With the advance of industry and settlement, and the increasing activity of the commercial hide-hunters, crocodiles disappeared from their old haunts on the east coast, while additional colonies of them were discovered along the Florida Keys, around the southern tip of the peninsula, on Cape Sable, and northward through the Ten Thousand Islands. The Keys populations have dwindled rapidly in recent years, and today the Florida crocodile is mainly confined to the coastal rim of the Everglades National Park and the Everglades National Wildlife Refuge. Here the surviving remnant



PHOTOGRAPH BY E. ROSS ALLEN

Newly hatched Florida crocodile (left) and alligator. The striking difference in color is immediately evident.

of the species thrives unmolested.

The natural history of the crocodile in Florida has never been intensively studied, and it is possible to give only an outline of the life-cycle and to point out the gaps in our knowledge.

The female crocodile does not build a nest of mud and plant material, as does the alligator. Instead, she selects a warm, sandy spot, usually on or just back from the beach, and scoops out a hole approximately a foot deep and eighteen or twenty inches wide. Here she deposits about two dozen eggs. The nesting hole is then filled in and neatly smoothed off to the level of the surrounding sand. Often, however, the position of the nest is revealed by little ridges and piles of dirt, gravel, sticks, or leaves, which the crocodile had pushed aside during her activities.

The eggs are quite large, about three inches long and a little more than one and a half inches wide, with a smooth, hard shell. They are normally white in color, but are usually stained brownish with earth. Since few nests have been examined, the maximum number in a clutch is not known. Nor is it known just how much time elapses before the eggs hatch.

In the American alligator and various Old World crocodilians, the female parent guards the nest against intruders, and, when the young are hatching, she tears the nesting material apart so that the babies can escape. It is uncertain whether the Florida crocodile digs up

her nest at hatching time. Several unguarded earth nests have been found, although in one instance a crocodile was observed to return to its nesting site, as though for an "inspection."

The developing baby crocodile is coiled neatly and compactly within the egg-shell, and when, upon hatching, it stretches to its full length of eight or nine inches, it seems far too large to have come from so small an egg. The little reptile is greenish-gray in color, with narrow black cross-bands; it thus differs considerably from the hatchling 'gator, which is black with yellow bands.

The exact growth rate of the Florida crocodile is not known. Most crocodilians in the wild apparently grow at a rate of twelve to eighteen inches yearly, at least for the first few years. Of course, captive examples, often kept under adverse conditions, may grow much more slowly. However, the specimens in road shows, billed as "Thousand-year-old Monsters," are in most cases no more than fifteen or twenty years of age!

The maximum length reached by the species, at least in the United States, is probably not much more than fifteen feet. The largest Florida crocodile authentically reported was the gigantic male killed by Jackson and Hornaday near Miami. The largest living specimen, so far as the authors know, is "Old Zulu," which for some years has been on display at the Reptile Institute at Silver Springs, Florida. This huge monster measured thirteen feet, eight inches in length in 1947, and has grown noticeably since then, being now close to fifteen feet long. (Needless to say, one does not make frequent measurements of such a ponderous and irascible creature!) A South American example of this species, however, was twenty-three feet in total length; this record, surprising as it is, seems well authenticated.

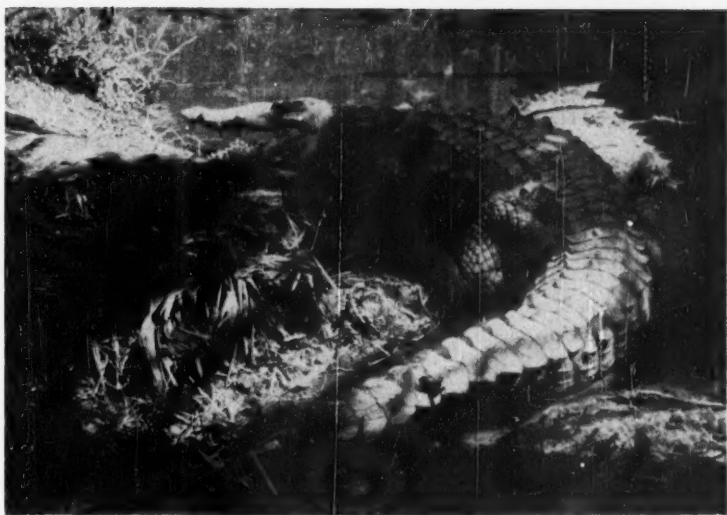
For all its size, speed, and formidable dentition, the Florida crocodile is yet a timid and inoffensive creature. Shy and retiring, it does not menace man unless actually molested, and will make off at top speed if given half a chance. The authors know of but a single case in which a Florida crocodile attacked a human being. This incident involved "Old Zulu," the enormous male mentioned above. Some years ago, "Old Zulu," then a free, wild crocodile, was basking in a swamp bordering Biscayne Bay. A party of surveyors came upon the reptile and fired two shots at him, blowing off one foot and inflicting a severe head wound. Thinking the creature to be dead, one of the men gave its body a sharp kick. Instantly the crocodile lunged open-mouthed at the man and clamped its powerful jaws

shut on his body. The man subsequently died from the injuries received. The crocodile, left for dead, was taken by a local resident, the operator of an animal show, who nursed it back to health and later sold it to the Reptile Institute.

Like the young alligator, the hatchling crocodile makes a series of croaking sounds when disturbed; and any adult crocodile in the vicinity, upon hearing this plaintive "distress call," will come charging over immediately. With a little practice, one can learn to imitate the call and thus provoke the captive reptiles into lunging against the wire of their pens (or attract an angry, wild specimen, if one is so inclined!) Curiously, the "grunt" that will lure alligators usually evokes no response from crocodiles, which react only to a more high-pitched and raucous sound.

When the growing crocodile reaches a length of between four and five feet, it seems to lose its "baby" voice, but develops the ability to make a sort of roaring or bellowing sound. One might truthfully say that its voice changes during adolescence! The bellow of the crocodile is rarely heard, and, in fact, may never have been previously reported in the literature. Nevertheless, crocodiles do bellow, at least occasionally. Four captive specimens, ranging in length from seven to twelve feet, were heard and seen to bellow simultaneously. The sound was a hoarse one, like a hiss amplified almost to a roar. The water in which the reptiles lay was visibly agitated by the vibration, and tiny droplets danced on the surface with each bellow. The crocodiles held their heads as high out of water as possible, and the snouts of the four were almost touching — a weird reptilian quartet!

The food of the Florida crocodile, as far as is known, consists mainly of small creatures, including fishes, birds, diamondback terrapins, crabs, snails, and occasionally younger crocodiles! In most



PHOTOGRAPH BY GEORGE BUSHMAN

**A fifteen-foot Florida crocodile captured in Biscayne Bay. Crocodiles usually rest with the mouth open, as shown.**

specimens, the stomach contains a number of stones and scraps of wood, which have been deliberately swallowed. It is thought that these objects, like gravel in a chicken's gizzard, may aid in grinding up the food, which is usually bolted in large chunks. Captive crocodiles often swallow pop bottles, tin cans, tobacco pipes, and just about anything else that falls or is thrown into their pen. Generally they suffer no ill effects from these

peculiar additions to the diet; but sometimes a large or oddly-shaped item blocks up the digestive tract, with fatal results.

Nothing much is known of the natural enemies of the crocodile. Raccoons, abundant in the reptiles' haunts, often prey upon the eggs and young of the alligator; and probably they account for some crocodiles, as well. Egrets and herons have been seen to eat baby 'gators, and doubtless they catch the hatchling crocodiles, also. The larger predaceous fishes may likewise exact some toll; for crocodiles, even very small ones, frequently swim some distance out to sea.

It is an interesting and little-known fact that alligators often occur in the same localities with crocodiles. 'Gators are most commonly seen about freshwater lakes and streams,



PHOTOGRAPH BY TOD SWALM

**The long, tapering snout of the crocodile is well shown in this photograph of a six-foot specimen.**

but nevertheless they thrive in brackish water, and are not infrequently found about saltwater bays and inlets. They are fairly common along the Florida Keys as far out as Key West, and also occur in the Ten Thousand Islands. There is no reason to think that the alligator and the crocodile are especially antagonistic toward each other, although they may compete for food to some extent.

Of course, the main enemy of the crocodile is man. In 1937, one of the authors noted that hundreds of crocodiles were killed by fishermen who accidentally caught them in their nets. Between 1939 and 1944, the operator of a reptile exhibit bought about 300 specimens from fishermen whom he had induced not to kill them. But the activities of fishermen were insignificant compared to the depredations of commercial hide-hunters, who nearly exterminated both the crocodile and the alligator before laws were passed to halt the slaughter. Since 1944, both species have been protected in Florida, at least during the breeding season, and specimens under four feet in length have been protected the year around. At the present writing, it is illegal to molest at any time the nests, eggs, young, or adults of these two interesting reptiles in Florida. In October, 1951, the season was opened in North Florida on alligators 8 feet or more in length.

It would be improper to close without a few remarks on that time-honored question, "What's the difference between an alligator and a crocodile?" Here it should be noted that there are two kinds of alligators, one in the United States and the other in China; and there are many kinds of crocodiles scattered throughout the warmer regions of the world. Of course, the question usually has reference to the American alligator and the Florida crocodile. The differences between these two are numerous. Thus, the alligator lays larger eggs. The baby 'gator is shorter but heavier than the hatching crocodile. The striking color differences between the two have been mentioned previously. The alligator has a broad snout that rounds off rather abruptly, while the crocodile has a long, tapering snout. This dis-

tinction, however, is not so pronounced in the juveniles. The alligator is stouter in build, and, on the average, has ten more teeth than the crocodile will present.

There is a big difference in behavior and disposition, too. The crocodile is swift, agile, and alert, usually hard to approach, and never trustworthy in captivity. The alligator, in contrast, while no sluggard when disturbed, is comparatively slow and clumsy, at times seeming rather dull-witted, and docile in captivity.

The differences between the two species also involve many deep-seated aspects of behavior, anatomy, and physiology, some of which are not immediately evident. For example, the alligator easily withstands cold weather by retiring to its den, which it had prepared long before, and by gorging itself to repletion just prior to hibernation. But the crocodile has little instinct to hibernate, and, if the temperature of the water falls much below 65° Fahrenheit, it becomes torpid and may sink to the bottom, there to drown. This distinction alone may explain why the crocodile has always occupied a very restricted area in the United States.

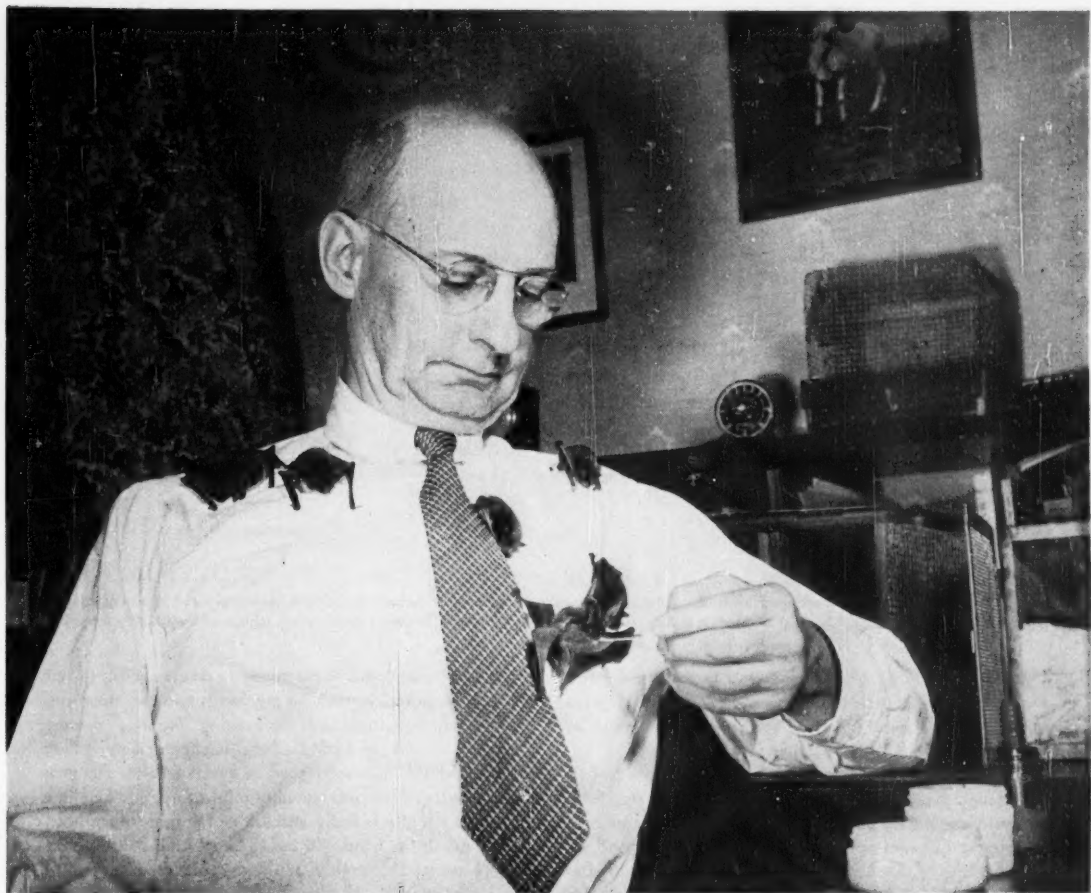
It is often said that the crocodile opens its mouth by moving the upper jaw, while the alligator moves the lower. This is completely untrue; both species have similar jaw action. It is true, however, that the crocodile almost always rests with its jaws open, while such behavior is but rarely noted in the 'gator.

One of the most impressive sights in Nature is a large crocodile disturbed at its basking and making its way to the safety of the water. The speed of the creature at such a time is rather surprising, and the posture is still more so. The belly is held well off the ground, with the hips decidedly higher than the shoulders. The neck is raised and the head points straight forward; only the last half of the tail touches the ground. Running almost on tiptoe across the sandy beach, the reptile slips into the water and only a trail of bubbles marks its passing. The observer is reminded instantly of the reconstructions of ancient dinosaurs. The naturalist of today is indeed fortunate to be able to see wild crocodiles, true relics of the Age of Reptiles.

## Driftwood

By COSETTE MIDDLETON

This weathered phantom, satined to my hand,  
Has been caressed and tortured by the sea —  
By dark and jealous waters, restless sand,  
And by the jut of rocks that, angrily,  
Tormented, slashed it in a timeless quarrel;  
The convolutions and the scars disclose  
It may have wandered, lost, in caves of coral,  
Or swirled down stormy archipelagoes.  
But grace and form and color contradict  
The age and substance of this derelict —  
Is it a figure-head that has withstood  
Both time and distance? Is it gopherwood  
From Ararat? Or is it nothing more  
Than sea-pine washed back to its native shore?



Ernest P. Walker, assistant director of the National Zoological Park, Smithsonian Institution, Washington, D.C., feeds a long-eared bat, *Corynorhynus rafinesque*, while he is, at the same time adomed with pipistrelle bats, *Pipistrellus subflavus*; big brown bats, *Eptesicus fuscus*, and little brown bats, *Myotis lucifugus*, also awaiting dinner.

## Bats Are Friendly

By ERNEST P. WALKER

Photographs by the Author

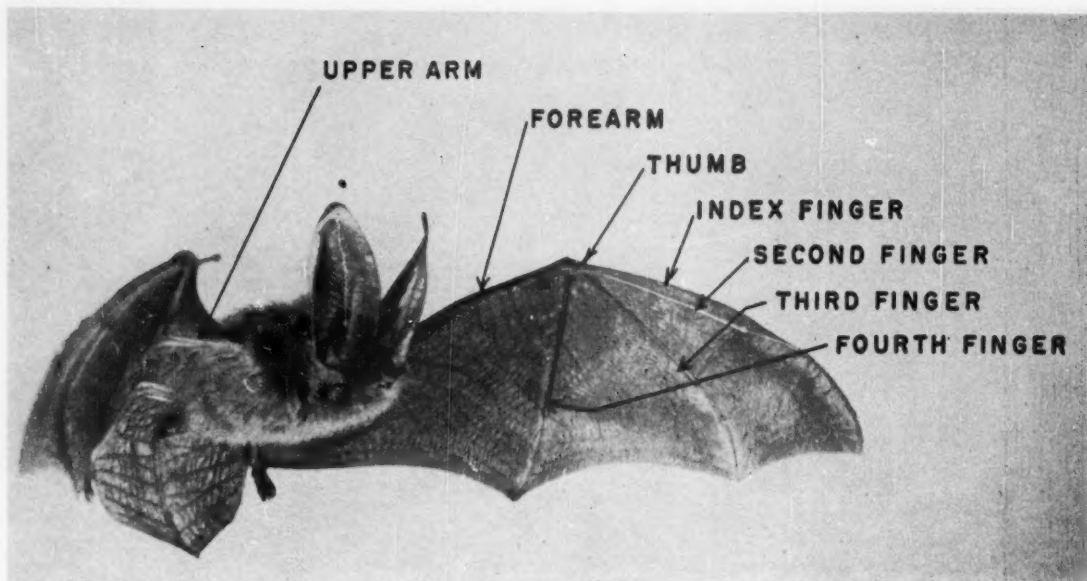
**I**N THE course of zoological studies I have found the secret of taming bats so that they become friendly and voluntarily come to me. I have taken many photographs of them in flight, as well as at rest, with the electronic photoflash. They are charming little creatures, much maligned by people who know little about them. In fact, most bats are valuable as insect destroyers, and few of them do any of the bad things they are supposed to do.

The largest of the more common bats of the United States and Canada is the big brown bat, which has a wingspread of about ten inches and weighs about half an ounce. Their teeth are so tiny, and their mouths are so small, that the worst damage they can do to one is to make a few

small, shallow punctures of the skin, and often they can not even break the skin.

Bats are mammals — furry creatures whose arms and fingers are greatly elongated to carry the exceedingly thin, rubber-like, flying membrane. The membrane is also supported by the legs, and, in many species, by the tail.

Bats are marvels of grace and agility in flight. They can take off from horizontal surfaces, such as a floor. They generally sleep hanging head downwards. Some bats migrate, but many hibernate in caves where the winter temperatures range from about thirty-five to fifty degrees Fahrenheit. The bats that I have studied have a daily temperature fluctuation between the temperature of the

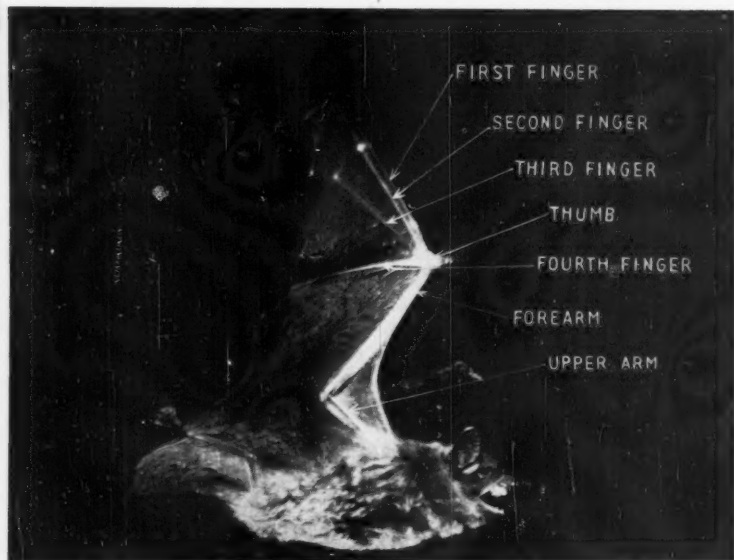


A long-eared bat approaches the camera. This bat weighs only about one-fourth of an ounce. Its body is heavily clothed with very soft and fine fur. The long ears probably assist it to locate insects, on which it naturally feeds. The wing membrane is supported by a highly modified, long, slender arm and hand.

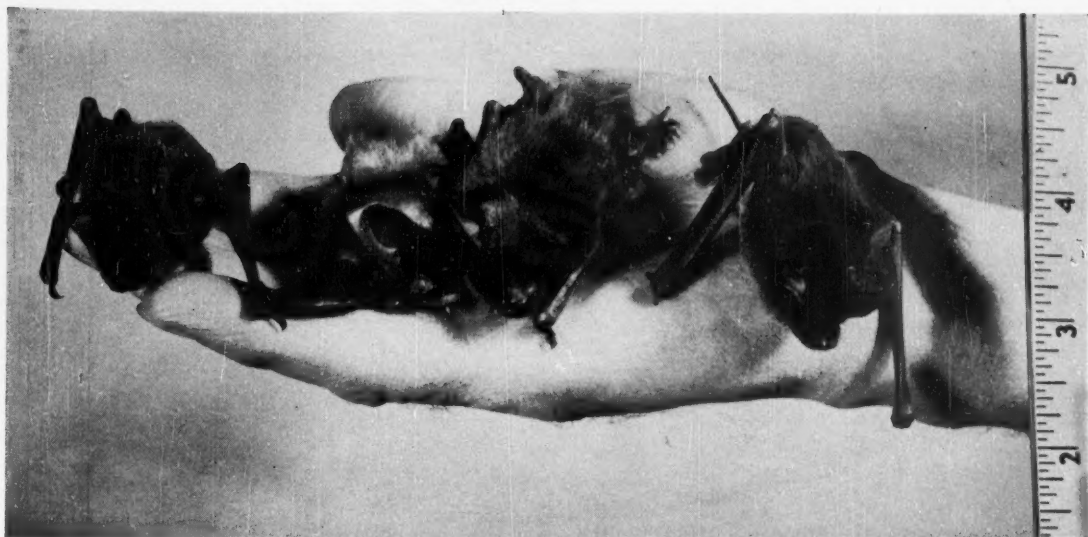
place in which they are sleeping, and their normal body temperature, when active, of about 103 to 105 degrees Fahrenheit. In some instances there may be as much as fifty degrees range of temperature in a day.

For many years I tried to get on intimate terms with bats by treating them kindly, feeding them, and allowing them to fly in our home, but I made little progress. Finally, I adopted a different approach, and at once had good results. I noticed that bats were cold, stiff and sluggish after sleeping for a few hours. So I began to warm them in my hands before attempting to feed them or to let them fly. At once I found that they became more friendly, took food readily from my hands, and quickly lost all fear of

me, and they would alight on me to receive food, to rest, or sleep. Keeping them in my hands to warm them prevented me from looking at the evening "funnies," or other reading or work, so I adopted the practice of putting them inside my shirt to warm up while I relaxed after dinner in the evening. This was mutually satisfactory, and I believe brought about a friendly attitude more rapidly than holding them in the hand. In ten to twenty minutes they become warm, thoroughly awake, groom themselves, and begin to scramble about. Then I take them in my hand, give them food, and let them fly. Some return promptly for more food, others require a few lessons to learn the full technique of our cooperative arrangement.



An unusually light-colored, big brown bat in flight. The upper arm, forearm, thumb and four fingers are clearly evident. The thigh, lower leg and foot are also shown supporting the flying membrane. Bats fly with their mouths open, apparently to utter their supersonic calls that have been compared to radar, and which probably helps them to navigate in total darkness.



A handful of bats and all interesting. From left to right we have the little brown bat, the long-eared bat, the big brown bat and the free-tailed bat, *Tadarida mexicana*. Thus Mr. Walker's bat friends vary, each differing from the others, and he has a good word for all.

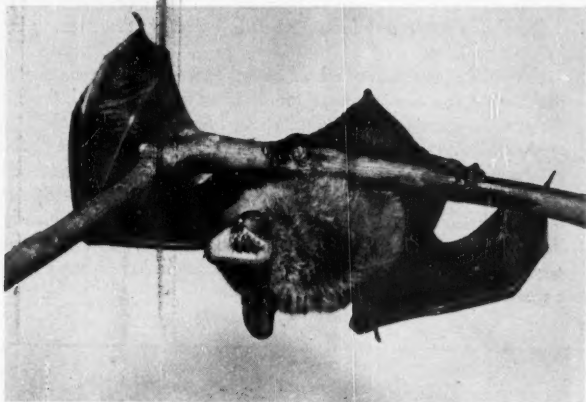
A big brown bat and a flying squirrel rest on Mr. Walker's arm. The bat seems intently watching the little squirrel with an acorn. In his right hand the author and photographer holds the push button that operates the camera and flash apparatus that enables him to take self-portraits of his animal pals and himself. Mr. Walker has also raised and studied the charming little flying squirrels, about which he wrote in *Nature Magazine* for February, 1951.



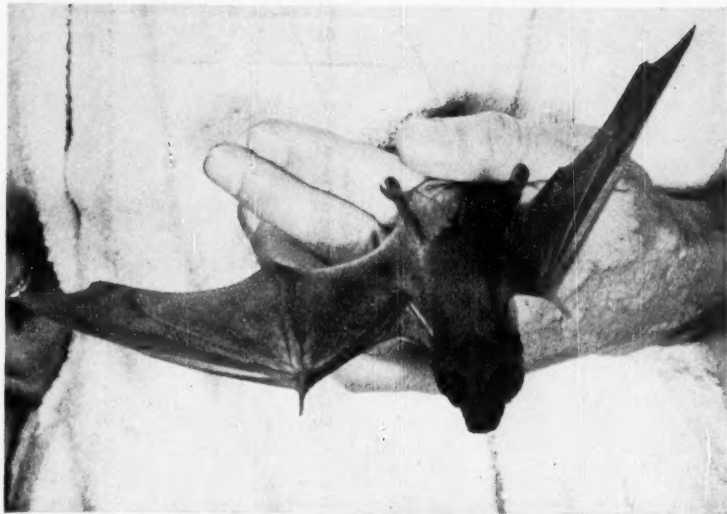


Front and back views of long-eared bats hanging from a small twig as they do when resting. The thumb and its claw are conspicuous in the bat facing the camera. The furled membrane of the wings and legs is well shown in the bat that has its back to the camera.

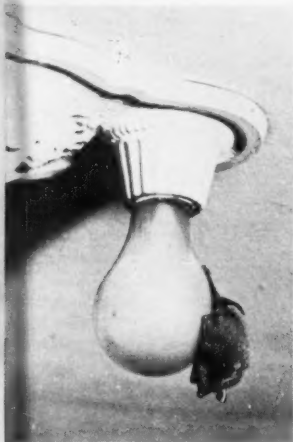
A baby pipistrelle bat taking milk from a quite small eye dropper. This little fellow was able to fly but not yet up to eating solid food. Many baby bats cling to the mother and are carried about by her when she is flying. Some mother bats, however, leave their babies hanging in some safe place while she forages for food.



A big brown bat protests at being disturbed as it hangs from a twig. While this bat has sharp teeth that are tiny and yet quite large in proportion to the size of the animal, and its weight of about one-half an ounce, these teeth cannot break the skin of the hand of a man whose skin has been toughened by hard work.



The free-tailed bat is notable for its long, narrow wings. The flight of this bat is somewhat like that of the chimney swift. This is the species that is so abundant in Carlsbad Cavern in New Mexico and in other caves in the southern United States and Mexico. The evening exodus of the bats from Carlsbad Cavern is an awesome event and indicates the value of bats in insect control, for the animals go out in the evening in search of food and water.



Before adopting this method, I had concluded it was hopeless to try to develop friendly attitudes in bats, but now I believe they are among the most readily tamed of any animals with which I have worked. Some take the first food offered them and continue to be friendly and easily handled from that moment onward.

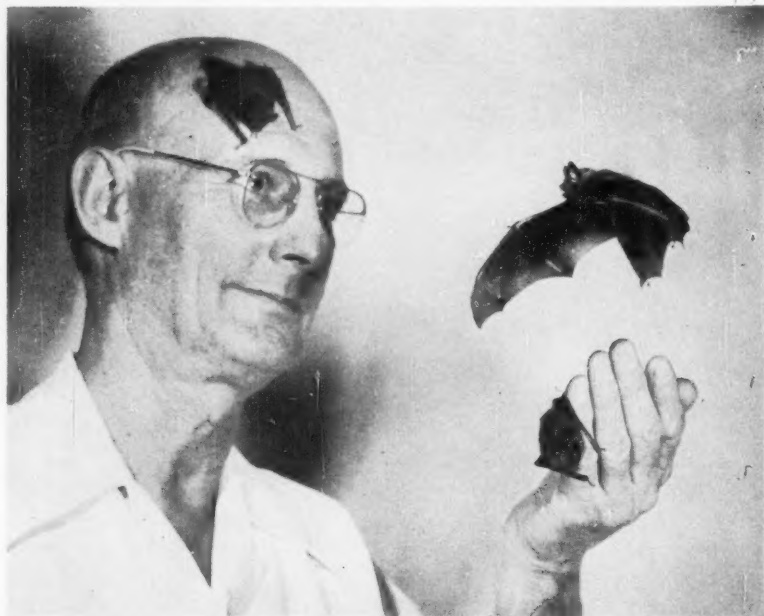
Supplying satisfactory food for bats is a problem that I solved by developing the following mixture:

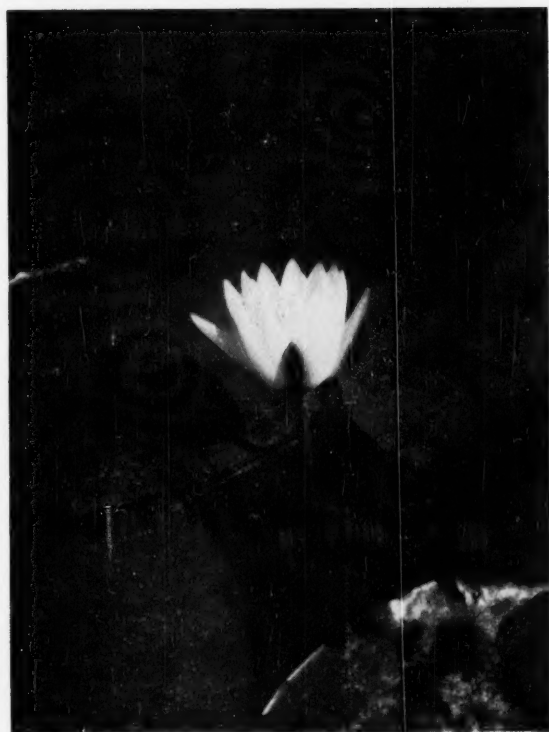
One-half of the yolk of a hard boiled egg, the same quantities of cottage cheese, ripe banana and meal worms, three drops of wheat germ oil, three grains of Squibbs therapeutic vitamin formula, and about four drops of Upjohn's Jeculin. All are mashed together and thoroughly mixed into a paste with the chitinous shells of the meal worms in it. The paste can be fed to the bats from a spoon or spatula, or they will eat it from a dish or other flat surface. I prefer to hold them in my hand when feeding them. This promotes a friendly attitude. Bats are greedy and since they do not get much exercise in captivity it is necessary to avoid over-feeding. They require a great deal of water to drink and should have some constantly available in a shallow dish.

At the top of the page a big brown bat is seen coming in for a landing on the author's hand. This picture shows clearly how the flying membrane is supported by the arms, fingers, legs and tail. The slight projection at the angle of the front edge of the wing is the thumb.

Directly above, a pipistrelle hangs to a ceiling lamp bulb. It has hooked its tiny claw into an almost microscopic imperfection in the surface of the bulb. How it found this flaw is a mystery.

At the right is evidence of the friendliness of the pipistrelle bats and the manner in which they come for food.



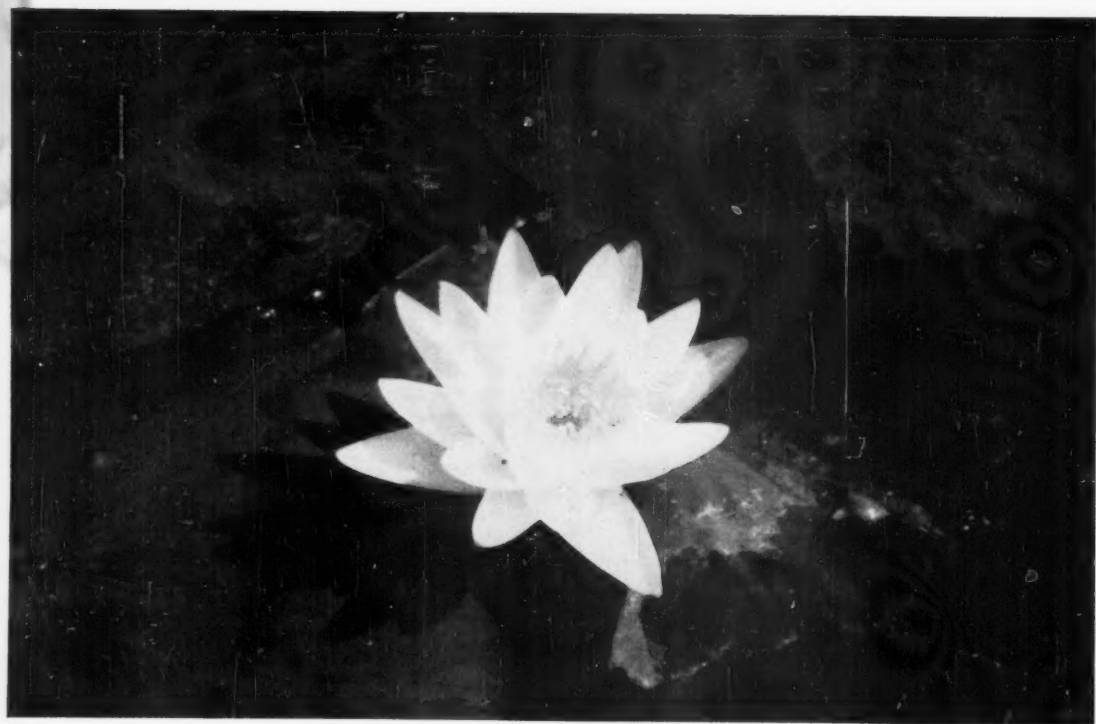


## A Water Lily Blooms in A Florida Marsh

*Photographic study by Hugo H. Schroder*

**P**ATIENCE and enough film can record on paper the blooming of a water lily, for such blooming is not a long process. Nature photographer Schroder set up his camera to make such a record. Above, at the left, the bud is just beginning to open. At the right, a few minutes later, more expansion is shown and more petals are visible. At the left the opening of the bloom throws a larger shadow on the leaf at the left, and there is a reflection in the water.

On the next page the picture at the upper left shows a change in the position of the shadow, which indicates that minutes have gone by since the previous exposure. Upper right, next page, the lily has come almost to full bloom. At the bottom of the page is the fullest expansion of the flower for the day, showing it in all its pure beauty.



# An Open Mind

## An Editorial

WHEN, in April, 1950, Oscar L. Chapman, Secretary of the Interior, held a public hearing on the controverted question of the erection of dams in Dinosaur National Monument, there was imposing testimony by Senators and Congressmen in support of the plan, giving it a distinctly political aura. Other proponents, including the Bureau of Reclamation, testified that Echo Park and Split Mountain dams were essential to the full realization of the Upper Colorado Basin Storage Project.

Opponents of these dams were many, representing conservation organizations that recognized the dangerous precedent involved in such an invasion of a National Park Service area. Their case rested upon this point, upon the superlative character of the Monument, and upon assertions that there were other dam sites that would serve the purpose. It was not then possible to present factual argument in support of this last point.

Secretary Chapman took the matter under advisement, and, in due course, rendered an opinion that, on the evidence, the Bureau of Reclamation's program appeared to warrant his approval.

In the meantime defenders of national park areas had not been idle. A representative committee met with Secretary Chapman and asked that opportunity be allowed for them both to study the area, and to present an engineer's report on the matter of alternative sites. This permission was granted, and General U. S. Grant, 3rd, an engineer and president of the American Planning and Civic Association, took on the task of this survey. Also several groups went into the area, which has thus far been only rudimentarily opened up because of lack of funds for the purpose in National Park Service appropriations. Reports of the superlative character of the Monument were glowing, and the importance of its preservation reemphasized.

On August 27, 1951, General Grant sent his recommendations in favor of alternative sites. In his letter of transmittal he said that, with respect to the Upper Colorado Basin Storage Project, "it appears that the Bureau of Reclamation really has not done the field investigation necessary or appropriate to establish the practical soundness of such an ambitious project. In fact, the Bureau has such information only about the Echo Park dam site, which justifies the inference that it is and has been primarily interested in getting special authority to build this dam and start this element of the project, in violation of the wise general policy to protect all National Park and Monuments against such encroachments, established many years ago by the Department of the Interior and put into law by the 1935

amendment to the Federal Power Act."

Since the submission of General Grant's report and recommendations, official action has been in abeyance. Conservation organizations, however, have been co-operatively active in a program of public education on the issue. Proponents of the plan have recognized the strength of the opposition to the dams, and also have set about on their own educational program. No little of this has been misrepresentation, as we have previously commented in these pages. No legislation was filed with the Congress to carry the project, or the controversial part of it, into effect. Opponents have been pictured as against providing much needed water and power in the Upper Colorado, a complete distortion of the facts, of course.

Then, in addresses to the Sierra Club on November 10, 1951, and the annual meeting of the National Audubon Society on November 13, Assistant Secretary Dale E. Doty and Secretary Chapman, respectively, expressed the hope that a solution of the issue might be found so that Dinosaur National Monument need not be used for water storage purposes.

These statements were immediately seized upon by proponents of the dams, and by those newspapers favoring them, as reversal of policy; even betrayal. One of the duties of those who direct the Interior Department is to protect National Park areas from exploitation. It is therefore their responsibility to weigh every aspect of any plan that proposes such exploitation. That is all that Secretary Chapman is doing, and he deserves great credit for so doing in the face of political pressure.

From the manner in which the hopeful expressions of both secretaries were received by those who would destroy Dinosaur National Monument, it seems evident that they are not interested in a fair solution of the problem. Indeed, it appears that they have achieved a state of mind that demands the dams in the Monument, whether justified or not, just as a matter of downright stubbornness. This attitude is understandable — although not forgivable — in politicians, who do not like to get licked on an issue they have espoused. But it is not understandable in engineers.

We have no idea as to what decision Secretary Chapman will eventually reach, but we believe that it will be an honest decision as he sees it. If he finally decides in favor of the dams we will, of course, be sorry and join with others in opposing the program before the Congress. But so far as the Secretary of the Interior is concerned we know that he has been open-minded and we salute him for it.



WASHINGTON POST PHOTO

Berries and bloom of the Glastonbury Thorn at the National Episcopal Cathedral in Washington, D.C., flank the silver box in which they were presented to Princess Elizabeth of England on the occasion of her visit to the Cathedral in November, 1951.

## Glastonbury Thorn Maintains Tradition

By E. JOHN LONG

**C**ALL it coincidence if you like, but Washington Cathedral's famous Glastonbury Thorn has again lived up to tradition. It blossomed when Princess Elizabeth and Prince Philip visited the Cathedral during their "two very happy days" in the Nation's capital early in November, 1951.

America has few legends, compared to Europe, so it is worth recording that the stubby little tree in the Cathedral Close offers one of our pleasantest traditions, plus a bit of mystery, on this side of the Atlantic.

Ordinarily the hawthorn, of which the Glastonbury Thorn is a distant cousin, blossoms in May. But the Glastonbury Thorn in the Cathedral grounds atop Mount St. Alban sometimes blooms at Christmas time, for what reason botanists and horticulturists do not know.

But they are really mystified by another of the tree's strange habits, and therein lies the tradition. Three times the tree has come into flower when royalty called at the Cathedral, and never during a normal blossoming period! This information comes from no less a chronicler than Canon Charles Martin, headmaster of St. Albans School for Boys, within whose section of the Cathedral Close or yard the tree was planted early in the century.

The story got its start in November, 1919, when the Prince of Wales, now the Duke of Windsor, visited St. Albans. Two or three white blossoms opened, and,

in keeping with a custom dating back some time, they were presented to him in a silver box.

Later, the tree bloomed for Queen Marie of Romania, who made an official visit to the Washington Cathedral in mid-November, 1926. In the summer of 1939, when King George VI and Queen Elizabeth visited Washington, but *missed* a schedule call at the Cathedral, the Glastonbury Thorn did *not* blossom!

In its latest bow to royalty the tree fairly outdid its previous efforts, producing four snowy blossoms two days before the royal visit. A silver box was hastily obtained and inscribed: "Bloom of the Glastonbury Thorn, Washington Cathedral, Presented to H.R.H. Princess Elizabeth, November 2, 1951." The presentation was made by Somerville Parker, senior prefect of St. Alban's School, and Mary Sherman, president of the student council of National Cathedral School for Girls.

Just what is this Glastonbury Thorn? And how did it acquire its uncanny blooming habits?

Botanists have referred to this race under two scientific names, *Crataegus praecox* and *Crataegus oxycantha*, evidently due to uncertainty as to its exact place of origin, probably either in Eurasia or the Mediterranean region.

The common name is derived from Glastonbury, an ancient British town in southwest England near Wells. The tree in the Washington Cathedral Close is an off-

shoot of an even more famous shrub in the grounds of the venerable Glastonbury Abbey, and was presented to the Cathedral of St. Peter and St. Paul — the proper name for Washington Cathedral — by the Bishop of Bath and Wells in 1902.

According to English legend, St. Joseph of Arimathea, who took Jesus Christ from the cross after the crucifixion, later went to Britain. When he reached what is now Glastonbury he erected a rude wood and wattle-work chapel, the *Vetusta Ecclesia*, as a repository for the chalice of the Last Supper.

Tradition says also that he thrust his staff into the earth and claimed the island of Britain in the name of the Lord. The staff, the story continues, took root and grew into a thorn tree that became greatly revered. Pilgrims to Glastonbury prized its blossom, particularly those which appeared at Yuletide. The settlement was visited by St. Patrick (one legend says he died here in 463 A.D.), and in the 7th Century an Abbey was founded. In 940, when the Abbey came under Benedictine rule, it became a center of learning for all south-west England. King Arthur and Queen Guinevere were also reputed to be buried here. The Abbey, suppressed in 1539, is now in ruins.

The Glastonbury Thorn meanwhile had its own troubles. Cromwell's men hacked it down, but it arose again from the roots, and two offshoots, with the unimpaired virtue of blossoming at Christmas time, were successfully planted elsewhere in the Abbey grounds. The original root eventually died, and on Wearyall Hill, Glastonbury, a modest stone now marks the site where St. Joseph is reputed to have thrust his staff into the ground.

Historians, while granting that Glastonbury Abbey represents one of the earliest Christian foundations in England, are somewhat skeptical of both the Arimathea and King Arthur associations. They point to a rather detailed history "On the Antiquity of the Church of Glastonbury," written by William of Malmesbury in A.D., 1125. William makes no mention of either, nor does anyone else writing prior to the fire that destroyed the entire establishment, and all of its original records, in 1184.

The legends, therefore seem to have sprung Phoenix-

like from the ashes, for the remains of King Arthur and Queen Guinevere were reported found in 1191, shortly after rebuilding had begun. The Glastonbury Thorn tradition followed some time later, the exact date being unknown.

Botanists who have examined the offshoot trees at Glastonbury consider that they, like the familiar English hawthorn, *Crataegus monogyna*, are of Mediterranean origin. But they ascribe the plant's peculiar habits and characteristics to the strong possibility that it is nothing more than a perpetuated sport, or mutation. That is, the Glastonbury Thorn is an offshoot, differing from its parents in some marked characteristics, as distinct from gradual variations in which new characteristics become developed only in the course of many generations. Scientists declare that the Glastonbury Thorn may be a perpetuated sport obtained by grafting from the common thorn, because trees raised from the seeds of the parent shrubs have reverted to the ordinary type.

Several attempts have been made by leading horticulturists of this country to get a graft or slip from the Glastonbury Thorn in Washington, but none of them has been successful. However, the tree survived a serious accident in the mid-1940s. Following a heavy snowfall, the weighted branches split the trunk right down the middle. Half the tree lay in the grass on one side of its circular plot, and half lay on the opposite side.

Tree experts, hastily summoned, shook their heads. But the Cathedral's superintendent of grounds, Mr. Griffith C. Barry, decided to experiment. With ropes he pulled the halves together, and bound the trunk tightly with tire tape. A thin metal bolt was used to reinforce the junction. The tree survived and the trunk grew together again. Today hardly a trace of the cleavage can be seen.

Washington's Glastonbury Thorn is a thick, bushy tree, whose branches extend twenty feet or more laterally from the trunk and an equal distance upward. Like the common English and American hawthorns its white flowering is showiest in May. The red or scarlet berries, the size of a pea, remain all winter, and its leaves are still green when the deciduous trees of the Cathedral Close are bare.

## Snake in the Grass

Man wishes sometimes he were green  
Enough to slip through grass unseen;  
Made dappled as sun-patterned leaves;  
Gay printed with bright floral wreaths.  
Man sees why snakes must flutter fangs;  
They have no eye-lids; ears nor bangs  
Nor limbs — the whole two-thousand species  
Slide where their scute projection reaches.  
Man wishes his tongue had a sheath,  
His mouth renewing, snake-like, teeth.  
(Within *vagina-dentis* sprout  
New teeth for old that prey pull out.)

By LOUISE MAYERS MEREDITH

Man craves no larynx, like a snake,  
No vocal sounds his chords will make;  
Man could be sure then not to say  
The words he might want back some day.  
From dreaded Mamba, Python, Boa,  
Rude Rattler, Mocassin and more,  
To burrowing *Typhlopidae*,  
Benign *Leptotyphlopidae*  
Including "earth snakes" of Ceylon,  
Man views them thinking he would don  
New vestiture — from life not pass  
But leave his old skin in the grass.

# Highland Trees and Jungle Magic

By HENRY S. KERNAN

**Kenua trees of Mt. Sajama, Bolivia, are in a national park but are being turned into charcoal for La Paz.**



**A**MONG the community of nations, the Republic of Bolivia has long been rated as one of the least known and least accessible. Accidents of history and geography severed it from the world's main travel routes, while a merry-go-round of turbulent politics has hindered the economy and kept the natural resources, except for silver and tin, largely intact. But even Bolivia cannot long resist the whirling vortex of international trade. Exploitation will be the order, at an increasing tempo. What lies ahead may be a social wasteland or it may be, if not a paradise, at least something more happy and stable than the present monstrosity. In Bolivia, as elsewhere in the world, man's ability to use natural resources wisely is being tested as never before; and man is coming to realize to what extent his future welfare hinges upon this issue.

Consider, for example, Bolivia's forest resource — an area of 128 million acres, the vast extent and complexity of which both enthrall and bewilder. Hereto-

fore inroads of exploitation have not been many; but they have been deep at sensitive points and are sharpening the issue as to whether the cancer of destruction will grow or subside. In each of Bolivia's three well-defined regions an outstanding tree is under heavy pressure and illustrates the problems of conservation in a primitive country.

One of these is the kenua tree of the high Andes. It grows in the extreme western part of the country, where the Andes have already thrust themselves south in a final sweep to form an elbow around the heartland of Bolivia and has been split into two of the world's highest ranges, which lock between them a plateau more than two miles above the sea. This is the wild and lonely *puna*, whose bleak climate and thin soils have supported a race of men for centuries. Year after year the sturdy Aymara Indians carry out their patient and toilsome round of tith and harvest. But their meager livelihood of small grains and tubers, oxen, sheep,

donkeys and llamas is softened and dignified by the songs, dances and colorful myths of their race and by the immense grandeur of their native land. A horizon of jagged, ice-capped peaks and a landscape of rock, sand, and grass are all that the Aymaras know throughout their lives. Slow and tenacious, they cling to the soil where legend places their origin. The turquoise waters of Lake Titicaca gleam and sparkle in the sunlight, and heave restlessly when whipped by chill winds blowing from Andean snowfields. Slowly they flow into the sluggish, meander-



**Contrasting with the kenua trees of the Bolivian high country are the great mahogany trees of the jungle lowlands.**

A coca field in the Bolivian Yungas. The Bolivian farmer terraces the steep slopes of this region for his agriculture.



ing Desaguadero River, and thence south toward stagnation in Lake Poopo and the endless marshes of Uyuni.

A very few Aymaras, nearly lost in a remote valley of this weird land, know of the kenua trees, which form, at altitudes of between fourteen and sixteen thousand feet, the highest forest in the world. The area lies between the extinct volcano Mt. Sajama and the western cordillera of the Andes. The exact range has never been studied precisely, although it was probably once much larger than at present. The tree is a member of the rose family and bears the botanical name of *Polylepis tarapacana*.

Ages ago, perhaps, this tree grew with other species in a milder climate. As the Andes rose, the others dropped out and the kenua adapted itself to a harsher environment. The long, tough roots grow down and out in every direction to anchor the bole and brace the crown against the almost constant winds that hurtle down the valley and drive clouds of sand, dust, sleet and snow in roaring crescendos of fury. The trunk, stubby and gnarled, is encased by layer upon layer of crisp, crinkly bark. The short stiff branches are densely covered by small, leathery leaves gathered into jacketed nodes around the tiny buds.

These trim little kenua trees are rarely more than twenty feet high, but they have a strikingly handsome appearance where the dark, glossy-green foliage and rusty red bark contrast with the dull landscape of the puna. A closer view will reveal the scattering of sere yellow leaves, the soft woolly white of the under side,

and the pink tinge of the minute flowers. Such characters at least suggest a relation with the rose, although a hasty glance reminds one more of the neat and thoroughly civilized box bushes that grace our southern gardens.

The open, park-like groves of kenua around Mt. Sajama represent the last remnant that tree growth can attain. They form a forest reduced to the very final degree or variety, size and vigor — a forest nearly static, without productivity or growth; indeed with little else beyond the ability to survive. It is perhaps less capable of sustaining commerce than any forest in the world.

Unfortunately the kenua has become involved in the charcoal trade to the city of La Paz. Thirty years ago a railroad was built eighty miles north of Mt. Sajama and wrote the doom of the kenua trees. Their dense, oily wood has proved excellent for warming the hands and brewing the coffee of Bolivia's chilly capital. Tons of it arrive every month; and since each ton represents the irreplaceable loss of several hundred trees, their survival as a forest type is clearly threatened.

More than a decade ago President Busch recognized the danger to this unique botanical curiosity. He declared Mt. Sajama a National Park and forbade further cutting. But nothing was ever done to enforce his decree and the brisk, highly destructive trade continues. Indeed the legality is admitted by a tax on the product and the use of the national railway for its transfer. It could be stopped im-



A sawmill in the jungle environment of the lowlands of Bolivia.



The hut and family of a charcoal burner on Mt. Sajama, where the native Indians live a precarious existence.

mediately by refusal to accept further shipments.

The question however, is a complicated one. The charcoal is made by Aymara herders, who for centuries have used kenua trees for fuel and for poles to support their low, round, sod-covered huts. They also build corrals of kenua and they brew the stringent bark into a tonic. At a subsistence level of culture, Indians usually bring about no violent changes in their environment. But once they are drawn into the money economy, of our "civilization," especially when some natural product is concerned, and aided by the inherent knowledge that their life affords them, they easily become experts in its exploitation. Thus the close knowledge of our own Indians of the habits of the beaver led them to become our unwitting assistants in the near extermination of this unique animal, whose threatened extermination started with our use of an ornamental kind of masculine headgear.

The beaver problem was settled only after a long period, a change of fashion, and the near extinction of the species. Perhaps when La Paz finds a better fuel than charcoal, or a better source than a bleak valley two hundred miles away, something will be left of the picturesque and fascinating kenua forest.

The official, although ineffective, interest shown by Bolivians in this highland curiosity, is in keeping with their orological traditions. They are a people eighty percent of whom live at altitudes of more than ten thousand feet. Their eyes are ever turned to the hills and their thoughts to the untold mineral wealth there. Were they a forest-dwelling, forest-using race, they

**Forest devastation in the Bolivian lowlands. There is yet time so to manage the rich forests of this country that they may be a resource for the future.**

would travel east to discover one of the largest, richest tropical jungles left intact in the world. They would also note the curious fact that only five percent of Bolivians live in the eastern two-thirds of the country.

The east-facing slopes of the Andes are broken into deep narrow valleys called the Yungas. Those nearest La Paz are well settled and are an im-

portant source of food supply to that city. Those further away have remained almost as primitive under republican Bolivia as they were under imperial Peru and Spain. Here, in the heart of the Andes, amid some of the world's most magnificent scenery, is the wild home of *Cinchona ledgeriana*, a tree of international importance since it was transferred to Java and became the only important source of quinine.

The Bolivian Yungas are placed so as to intercept the moisture-laden clouds that drift up the Amazon Valley. Hence they reek with fog and rain, from the foaming, rock-strewn streams through the oppressive heat of banana groves, and on up several thousand feet of sheer ascent through terraced fields and dense forests to the grasslands, and, finally, to the bare rock and glaciers. To cultivate this appallingly steep land, the Indian farmers terrace slopes of more than 100 degrees. With practiced eyes and crude spades, they fit intricate patterns into the contours of the mountains so precisely that the terraces vary not a hair in width over hundreds of acres. The principal crop is coca, a



low shrub whose cocaine-rich leaves are chewed by aboriginal populations throughout the Andes.

Here the forest, rank and dripping with moisture, becomes an almost impenetrable maze of mosses, vines, shrubs and trees. The air is heavy with the dank odor of innumerable flowers, from the most delicate orchids to great trees ablaze with color. Here indeed is a paradise for birds of bright plumage and loud song, and a haunt of monkeys whose chatter and howling add to the hubbub that greets the sunlight breaking through the clouds and makes the dripping foliage glisten and glow as if hung with crystal.

Many trees of the Yungas have characters that make them notable, one the flowers, another the bark, another the shape of the leaves, another sheer abundance, and so on. The most important has nothing to attract attention. The cinchona tree, the "fever bark tree," belies the legends of its romantic history and international fame of the precious anti-malarials hidden within the bark. It is a small, insignificant-looking tree, whose relation to the gardenia, coffee, partridgeberry and button-bush is not at first evident. Never common, it raises a drooping, open crown and a slender bole only in the shade of the deepest canyons and most tangled jungles far up on the steep mountain slopes. Sere leaves become a deep red before they fall; and folklore claims that when wind moves the pale, narrow foliage it emits a rustle distinct from that made by the hundreds of other species. Fact or fancy, these characters do not appear to be the clue to the uncanny skill of the bark-gathering quimeros to locate their prize.

The history of the cinchona industry has been one of booms and breakdowns. Bolivia supplied the seed for the high-grade trees now grown in Java, but has since been unable to match the quality of the cultivated product. Cutting for domestic use has continued, and the number of cinchona trees in the forest, never large, has sunk nearly to the vanishing point. The great quinine hunt in the Andes during World War II destroyed all but the most remote stands.

The tree does not grow abundantly from seed because special soil, light and moisture conditions are necessary for survival. On the other hand it will sprout vigorously if bark is left on the stump. The quimeros, however, insist on scraping off every last bit of bark and thereby needlessly kill the roots.

As the sources of quinine dry up, and as other, better, anti-malarials appear, the gathering of wild cinchona bark will go the way of so many destructive forest industries and disappear. Very gradually these curious little trees will come back to the Yungas and thus will be ended a history begun in 1636 when the Quechua Indians gave up their secret to the Spanish viceroy.

The great flat lowlands of eastern Bolivia are divided almost imperceptibly, one-quarter tipping southward into the Paraguay drainage and three-quarters into the Amazon. The former is the Bolivian portion

of the Gran Chaco, a dry, sterile waste partially forested by species that can endure much fire and drought. The Amazonian portion receives more rain. Belts of forest at the base of the Andes and along the rivers converge at about the thirteenth parallel and then continue solidly to the national boundaries with Brazil and Peru.

Conditions of tree growth are vastly different here from those in the Yungas. The topography is nearly level and poorly drained. Temperatures are higher and a distinct dry season breaks the monotony of clouds and rain.

Amid a superlative combination of soil, sunlight, water and shade, the growth and decay of plant life reaches an intensity and variety perhaps unequalled anywhere in the world. The sheer rankness of vegetation defies man's efforts to control it. Bird life is quiet, and the rare mammals tend to travel in droves and keep out of sight. Even the sounds one hears are tree sounds, of wind and rain in the foliage.

This half submerged land, so entirely devoted to plant and insect life, takes one far back to the time before hardwoods adapted themselves to the temperate climate by losing their autumnal leaves. All seasons seem to occur together in an Hesperides bright the year round with flowers and alive with the rustle of sere leaves swirling and falling to the warm, dank earth.

Chilly nights alternate with scalding noons. Yet in the forest shade, the air is balmy and reminds one of deep summer in the North. The power of the sun's heat has been broken far above by the dense canopy of treetops. Directly beneath is a zone for which there is no equivalent in our northern woodlands. It is not populated by small versions of the dominant trees, but by a myriad understory plants whose needs are for shade and moisture-laden air. They are vines, shrubs, ferns and mosses grown to such grotesque size that one passes under them on a forest floor surprisingly clear of debris.

North and south from either pole, plant associations become more complex and individual trees, especially hardwoods, reach finer proportions. A Laurentian forest of spruce and fir is simple compared to a hardwood mixture in the southern Appalachians. Placed so near the equator, the Amazon jungle has, through the creeping and timeless ages of history, become the supreme masterpiece of tree life, which we call a forest. Here where wind and sunlight move now gently, now strongly through countless forms of leaves, flowers, branches and trunks and blend the unending music of the rustling foliage with the countless variations of color, fragrance and shifting patterns of shape into an enchanting symphony of overwhelming power and magnificence.

Towering over the jungle, as our own white pine towers over the lowly beech and hemlock, the mahogany, monarch of the Amazon, raises a smooth, slightly tapering trunk and a lofty (Continued on page 106)

# A Bird-Seed Hunt

By JOEL MILES

"WHY don't we leave?" That is Joel.  
"Have we got any money?" That is Steven.

"When will you be back?" That is their mother.

We are going on another bird-seed trip. The boys have been fermenting, thinking of the things they are going to see. In our small packs are a hammer for breaking rocks, a magnifying glass, a manual of weeds, and a book to identify insects and butterflies. So we are off past the black walnut tree, after reassuring mother.

There is a little movement in the weeds in front of Steven. "There's a horny toad," he points. It scampers away in the low-growing weeds. In the patch is a weed we have not seen before. It is going to seed and we stop to see if it can be used in our mixture. The seed strips easily. It is put in the seed bag and will be harvested when we get home.

Weed seeds do not all mature at once, like a crop of grain. Some are green while others are still ripening.

Now, Joel points, "That looks like a new weed over there."

"We got that one last week," Steven counters.

This is our third trip to the same lot. First, we scouted it to see what kind of weed seed could be gathered. Then another trip was needed to get the earliest developing seeds. The lot is not far from our home. There is no need to wait for a special occasion; trips may be made from early spring until late fall.

When the snow is on the ground, the seed we gather is put out for the birds to eat. They are wild about it. The first year the seed was put out we started with seven sparrows. As more birds found out about it, more came. As long as sparrows eat as many grasshoppers as they do, we did not worry about feeding them. Soon we were getting the shyer birds, the song sparrows, and now and then what we took for a chickadee. All the birds were shy at first for they were not used to seeing the seed at this time of year. When they recognized it, they ate it readily.

The feeder for the birds had to be made large enough and high enough for safety. In their hurry to get the seed, the birds scatter it on the ground. Then they eat it, as they do in the fields, and they are easy prey for a cat.

Our manual on weeds is published by the Nebraska Department of Agriculture. It is called "Nebraska



Gathering the weed seed. Giant ragweed in the background. Lambsquarter is found in a patch like this one. And deep inside are the rarer weeds. They have to be searched out.

Weeds." It helps us identify the poisonous ones. We do not know whether the birds eat the seed from them, but we are not taking any chances.

There are a number of weed patches close to our house. Sometimes we go farther away when we think we may add variety to our seed mixture by finding a new weed.

The boys start into the patch, stripping the seeds from their stalks. "Be careful of the caterpillars," Joel warns. Caterpillars are especially bad on the dock we gather. There seems to be a certain kind that lives on it. We do not go into just any weed patch to gather any seeds there. The best types are those like dock, witchgrass, giant ragweed, lambsquarter, or wild oats. The kind we want is that which will shell out easily in our hand. The other kinds will not go through our harvesting device. Seeds that have a long stem that sticks to them, are not wanted, either. They clog the harvester. Still another reason for discarding weeds with stems is that they take up more room in the storage box.

If the seed is too dry it will shatter out when picked. Some of it must be gathered when it looks green. The kernel must not be underdeveloped, though. In many weeds it will harden, without too much withering, even though it is picked green. We can tell from a little experience when to gather it.

The box where we store the seed is an open-topped, cardboard one. We try to put it where the mice will not bother it too much while the seed is curing, for they seem to like it, too. When the box is full of seed, it smells like herbs. It does not spoil or mold, while

curing, if it is turned regularly.

"There's another horny toad!" both boys exclaim at once, and drop the bird seed hunt to chase down one of the little toads about an inch and a half long. They are fast little runners and slither in and out of the weeds. But the boys gang up on it. One holds his hands in front of the toad while the other one comes up from behind and captures it. They have heard that the yellow-bellied toads are poisonous, so they turn it over and expose its white underside. It passes inspection. Steven holds it in the palm of his hand. The toad is motionless, except for its blinking eyes. When he remembers he has no place to carry it he puts it down.

The boys come back to the seed hunt in the wild oats patch. It is just right for gathering and the boys take as much as they can, comfortably.

Gulls, related to those that came to the Mormons in Utah, soar and circle above us. The boys stop for a moment to watch. The flock moves slowly eastward. Joel picks up a rock. "Looks like gold," he mutters, "I'll bust it up and take some of the pieces home."

"Did you ever find gold?" Steven asks.

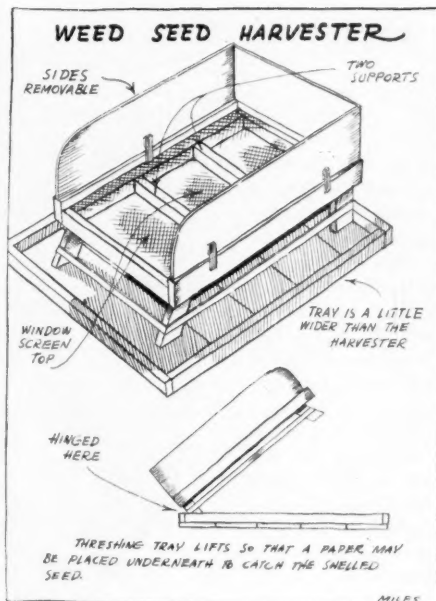
They get the hammer out of the pack and bang away at the rock. When it is broken he examines it carefully and decide it is made up of feldspar, quartz and mica.

The boys are beginning to tire of the bird-seed hunt.

Ahead of us there is a little grocery store on the corner. Gathering our gear together we walk toward it. "Maybe they'll have some penny candy. How much money do we have?" Steven asks. We buy a nickel's worth of candy apiece and keep on going.

A birch tree stops us for a minute. We talk about its white jacket and decide it would take more than our skill to make baskets and containers from its bark.

Farther down the street we see one of our landmarks, the oak tree. The boys go over to see how the acorns are progressing. Then they look at the neighboring haw-



thorn tree; the flowers are gone and the "red haws" are forming.

"Let's go farther," Joel says. So, we walk on past another one of our landmarks, the sugar maple. There is a mountain ash across from it. Behind the tree is the rock garden, which has snapdragons, cactus, columbine, and sedum in it. The rocks have been laid helter skelter.

The bird seed, although it does not weigh much, is getting heavy. The packs are starting to chafe, and we can smell the meals being prepared in the houses we pass. We have been away from home quite a while and we are getting hungry.

Joel exhales slowly, "I'm getting tired."

"Me, too," Steven echoes.

Going home by another route we pass a field that is speckled with white butterflies. "What kind are they?" Steven wants to know. The book for identifying insects is taken out and thumbed through. We decide they are cabbage butterflies.

The air is getting cooler, and the sun is sliding down behind the mountains. As we round the corner of the block in which we live we can smell the wood smoke from our stove. "Wonder if mother is making biscuits?" Joel asks.

We put the bird seed out in the garage. It will cure for a while and then it will be harvested.

When the weather is clear there will be other trips. They will not be too far from home, and probably will be very much like this one. New landmarks will be established. We will renew our touch with the old ones and learn some new things. Maybe there will be a new rock, a new tree, a strange insect, or a rare weed to add to our bird seed collection.

Then when the snow is flying and the birds are eating our mixture we can talk about the trips we took last summer and plan new ones for next year.

Nature is still a wonderful teacher.

## Blue Damsel Fly

By BELLE CHAPMAN MORRILL

No splash of paint colored your black lace wings,  
Your slender body barred and tipped with blue,  
Those two symmetrical black stencillings  
On your tiny head. Painstakingly God drew  
Each separate line. Thus all his art he brings  
To deck a short-lived creature such as you.

# Thomas Pennant

By W. L. McATEE

THOMAS Pennant never visited the western world but nonetheless won a place among authors of major works upon American animals by compiling the *Arctic Zoology*. Three volumes were published, relating to: mammals (1784), birds (1785), and reptiles and fishes (1787). The American Revolution had an important effect upon the project, which was interestingly explained in the "Advertisement" in the first volume. There he wrote — "this work was designated as a sketch of the zoology of *North America*. I thought I had a right to the attempt, at a time I had the honor of calling myself a fellow-subject with that respectable part of our former great empire; but when the fatal and humiliating hour arrived, which deprived Britain of power, strength, and glory, I felt the mortification which must strike every feeling individual at losing his little share in the boast of ruling over half of the New World. I could no longer support my claim of entitling myself its humble Zoologist: yet, unwilling to fling away all my labors, do now deliver them to the Public under the title of ARCTIC ZOOLOGY."

The volume on birds, comprising about 400 pages and 14 plates, had also a title-page vignette of the "Pied Duck," that is, the then living, but now extinct, Labrador duck. The total number of North American records in the book is 406, from which must be deducted: 78 duplicate entries, 6 mixtures, and 22 unidentified, besides 36 not North American or not accepted as such from his records, leaving a net of 264. Deductions made for some of the reasons noted, there are 101 specific records for New York State alone.

The largest contribution to the latter total, impressive for the time, was from specimens collected by Ashton, brother of Anna Blackburn of Oxford near Warrington, England, who maintained a museum, and for whom the Blackburnian warbler was named by John Latham in 1783. Ashton Blackburn lived on Long Island and collected in New York, New Jersey, and Connecticut.

Pennant's accounts of birds in the *Arctic Zoology* included lists of both scientific and vernacular names and notes on habits and histories when available. He had the great advantage of the loan of a large folio of observations in the Hudson's Bay country by Thomas Hutchins (for whom Hutchins's goose was named by Sir John Richardson in 1841); of specimens and notes from Newfoundland by Joseph Banks (later Sir Joseph, and long President of the Royal Society); and of correspondence with Dr. Alexander Garden of Charleston, South Carolina.

Pennant was an industrious assembler of information and he published some thirty volumes, mostly bulky quartos in as many years. Several of these, in addition to the *Arctic Zoology*, related to natural history



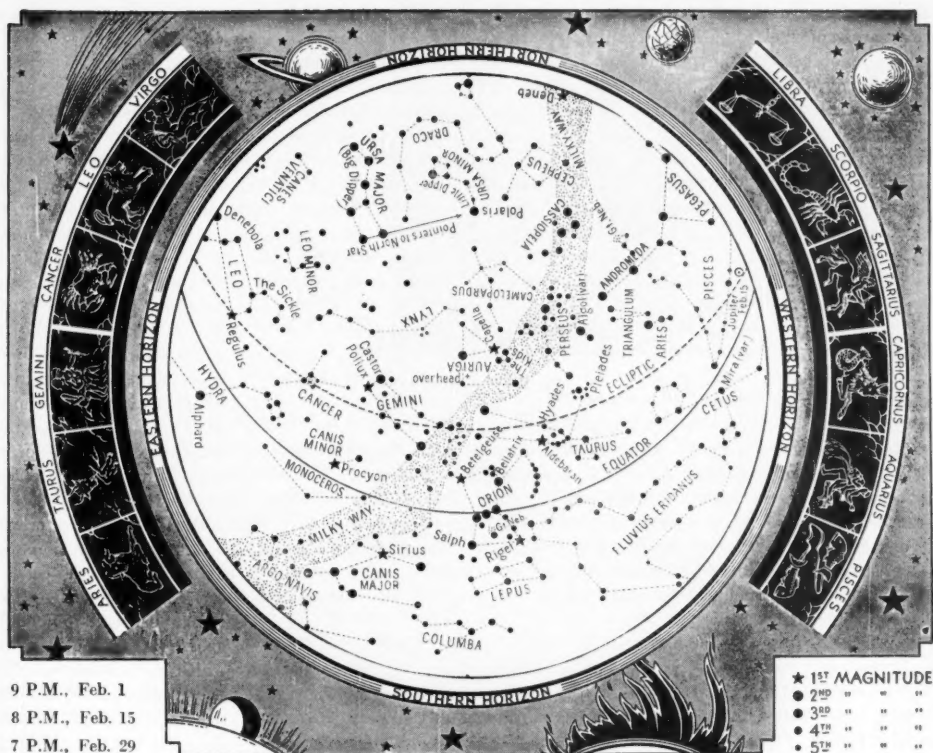
Thomas Pennant, 1726-1798

and they faithfully reflected the knowledge of their periods. Among these works were: *The British Zoology*, *Synopsis of Quadrupeds*, *Indian Zoology*, *Genera of Birds*, an account of the wild turkey, and an edition of Buffon's natural history of birds.

Diligent though he was in these fields, his favorite occupation was making tours, with a special eye to antiquities, and preparing reports upon them. Throughout his life he enjoyed good health and loved traveling. The incidental hardships, as occasional poor fare or lodging, did not bother him. Almost all of his journeys were made on horseback and he commented: "I consider the absolute resignation of one's person to the luxury of a carriage to forebode a very short interval between that and the vehicle which is to convey us to our last stage."

No printed record exists of his early tours in England, in Ireland, and on the Continent. With regard to the second, he wrote apologetically: "Such was the conviviality of the country that my journal proved as *maigre* as my entertainment was *gras*, so it never was a dish fit to be offered to the public."

The tours of Scotland in 1769 and 1772 had the largest results. The second was carefully planned and a preliminary circular addressed to "the curious in general," asking what information they deemed worthy of inclusion in the report, contained twenty-two questions on natural history, agriculture, antiquities, sports, festivals, and other topics, and requested the collection of information and (Continued on page 108)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

# Light-Time and Celestial Distances

By ISABEL M. LEWIS

THE distance that light travels through space in a second is, approximately, 186,300 miles. The distance of the moon from the earth when nearest to it, at perigee, is, in round numbers, 221,500 miles, and when farthest from it, at apogee, 252,700, the mean distance being approximately 238,900 miles. So, if a sudden explosion were to occur at the surface of the moon, that event could not be seen from the earth's surface until the light from that source had traveled the finite distance that separates earth and moon at its finite velocity of 186,300 miles per second. This would take one and a fractional part of a second, the exact time depending upon the position of the moon in its orbit relative to the earth.

As one views the moon shining by sunlight reflected from its surface, it appears not as it is at the instant of observation, but as it was one and a fractional part of a

second earlier. This is the shortest time that elapses from the instant when light leaves any celestial body until it enters the eye of an observer on the surface of the earth, excepting, of course, light from an occasional comet or asteroid that may chance to come closer to us than the moon. The interval of time that elapses from the time when light leaves a celestial body until it reaches the eye of an observer upon the earth is called the light-time for that body, and it is found by dividing the distance of the body from the earth at the time of observation by the velocity of light.

The astronomical unit, so-called, which is the mean distance of the earth from the sun, is taken as the celestial yardstick for the measurement of distances within our solar system. The adopted value for this distance at the present time is 92,900,000 miles. The light-time corresponding to this distance is about 498.6

seconds. At this distance of the earth from the sun 8 minutes 18.6 seconds elapses, then, from the time when any phenomenon occurs at the surface of the sun until it is observed on the earth. It is the *average* interval of time from the instant when light leaves the sun until it reaches the eye of the observer on the earth. The planet Pluto, which, so far as is now known, is the outermost planet in the solar system, is at a mean distance from the sun of about 39.52 astronomical units, or approximately 3670 million miles. At this distance from the sun it takes about five and one-half hours for a ray of sunlight to pass from the sun to Pluto. If the light of the sun were suddenly blotted out this interval of time would pass before that planet would cease to shine by reflected sunlight.

Leaving the solar system, and its interplanetary space where the unit of measurement is the astronomical unit, or mean distance of the earth from the sun, one passes on into the vastness of interstellar space. So inadequate has this unit now become either for measuring distances in the great galactic system, in which the sun with its attendant planets is but one among a hundred billion suns, more or less, or in the great beyond where the extragalactic nebulas lie so far exterior to our galaxy, that a new unit of measurement has to be adopted. The light year now takes the place of the astronomical unit. It is the distance that light travels in a year at the rate of 186,300 miles a second. It is equal to about 63,300 times the mean distance of the earth from the sun, or nearly six million million miles. Another unit of measurement known as the parsec is also used. It is equal to about 3.26 light years and is the distance at which a star has a parallax of one second of arc. So great are interstellar distances that *not one star*, so far as is known, lies within a distance of one parsec or 3.26 light years. The nearest known star is at a distance of 4.4 light years from the earth. It is the brilliant double star Alpha Centauri. An eleventh magnitude star known as Proxima Centauri is slightly nearer the earth than the bright pair, but belongs to the Alpha Centauri system.

Distances within even our own galaxy, or Milky Way system of stars, are inconceivably great. In shape it is a vast, flat, spiral system consisting of billions of stars, some double or multiple systems of physically associated stars, others single stars such as our own sun. These single stars, in many instances, may be attended by dark planet worlds, too small compared to the sun about which they revolve, and shining too feeb-

ly by reflected light from it, to be detected even in our most powerful telescopes. Also in this galaxy are numerous clusters of stars and great gaseous nebulas and much cosmic dust. Its center lies in the constellation of Sagittarius. Our sun with its planets is now located far from its center and near its central plane at an estimated distance from the center of something like 30,000 light years. The longest diameter of the galaxy, along its principal plane, is of the order of 100,000 light years, and its thickness is about 10,000 light years. The galaxy is in rotation and our sun, in addition to an individual motion of its own, is carried along by the rotation of the galaxy at a rate of 170 miles a second. From opposite sides of the center, or nucleus, of the galaxy two great streams of stars and gaseous matter emerge in the shape of spiral arms. In one of these arms is our own sun.

Outside of our galaxy, and at distances from it measured by millions of light years, there are, in addition to other external celestial objects, the great extragalactic nebulas, which resemble in spiral form and constitution and extent our own galaxy. These objects are also found in great clusters near the poles of the galaxy and, apparently, are

rapidly receding from it. The shift in the spectral lines of these objects toward the red has generally been interpreted as meaning that they are receding from us and has led to belief that the universe is expanding. The amounts of these red shifts increase with the distance of the object examined and have been found to be increasing at the rate of about 100 miles per second for every million light years in distance. If these red shifts represent velocities of recession these objects are speeding away from us with velocities that, at the greater distances, become comparable to the velocity of light. In the study of such objects the 200-inch Hale Telescope on Palomar Mountain is invaluable. Spectra of fainter and more distant nebulas than have ever been obtained before can be obtained with this telescope. It has already extended fifty percent farther into space the limit attained by the 100-inch Mt. Wilson telescope. The most distant nebula observed with the 200-inch telescope up to this time is in the constellation of Hydra; it is one in a cluster of such objects, at a distance estimated to be approximately 360 million light years. Its velocity of recession from the earth is the greatest so far observed in these objects, nearly 38,000 miles per second!

The nearest and brightest of the extragalactic nebulas is the Great Nebula in (Continued on page 106)

## Seven Stars

By HELEN JONES

This heavenly Dipper is securely set,  
Traced in gilt ink, and tilted toward this hill  
It shines as some celestial silhouette,  
Willing that every empty heart be full.  
In retrospect I stand here, now a man,  
Seeing a boy with hands cupped around a gourd;  
Remembering a prairie caravan,  
A camp at dusk, where springs of water poured.

This ladle in the sky spills heady wine  
From its unquestioned source; my eyes behold  
Again the blue night's studious design,  
The same Great Dipper, animated gold.  
From star to star, no naked eye has seen  
The astral chain that binds the space between.

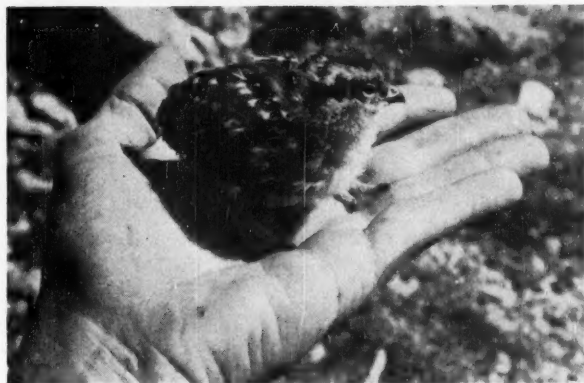
# Ptarmigan Tactics

By WARREN B. HAMILTON

THE HEN white-tailed ptarmigan, *Lagopus leucurus leucurus*, hustled her four chicks away as I topped a rise just at timberline near Wapiti Lake in the Rocky Mountains of northern British Columbia. My task as a geologist was to study the rocks they were on, but following the small brood was too strong a temptation. The chicks scattered, and I set out to capture one. The little fellow, with his ungainly, disproportionate feet, was too quick for me, running this way, dodging that, abruptly reversing direction, fading into his background wherever he stopped. Finally, he trapped himself by entering a natural box in the rocks, and I blocked his only exit. He made no move to escape from my hand, but called insistently for his mother.

The hen had, in the meantime, maneuvered the other three chicks to safety. I managed to get out camera, close-up supplementary lens, and tape rule with my free hand, and proceeded to portrait the chick. He would pose motionless on my hand: but let his feet touch ground and he was away. As the accompanying close-up shows, I soon abandoned hope for a "natural background" and settled for a bird in the hand.

Finished with photographing the chick, I kept him to see how the hen would react. She did not disappoint me. For several minutes, she had been standing a few yards away, watching. Now she rushed to within a few feet of me, wings arched, hissing furiously. She backed off, rushed again. I stood my ground. She went in angry circles about me, a scant yard from my feet. Next came the broken-wing routine. With one wing drooping behind, she would run by me as though injured, trying to make me follow and release the chick. She used either wing indiscriminately, and was even re-



duced to dragging by with both wings drooping. She finally ceased her efforts, but remained watchfully and belligerently near. But let me approach any of the other chicks, now motionless with their remarkable camouflage, and the hissing rushes and the "broken wing" tactics would be repeated.

Tiring at last of my role as tyrant, I set the captive chick on the ground. The hen ran in between me and the chick, shepherded him away, and gathered the other chicks as she went. The brood disappeared over the same rise where I had come a half-hour earlier.

The white-tailed ptarmigan, whose unfailing characteristic is reflected in both its popular and its scientific names, ranges in Canada from northwestern Mackenzie and the adjoining parts of Yukon, south to southern British Columbia. It is restricted in the breeding season to the alpine heights above timberline but in all probability descends in winter everywhere to lower altitudes. It was first detected in the Jasper-Mt. Robson region by Douglas or Drummond, members of the first scientific expedition ever to be launched in western Canada, and was reported on by Swainson and Richardson in 1831, in the Bird Volume of their extensive series.

Her chick — posing as a bird in the hand above — restored to her, the mother ptarmigan moves warily away, both birds blending into the background. A chick can be seen just above and to the right of the hen's beak.



# The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association.

## FIELD TRIPS DE LUXE

I HAVE just returned from three teachers' conferences held in different parts of the country. This, then, will represent a composite report on the views and attitudes of some experienced teachers, and teachers of teachers, with respect to conferences and, more particularly, with regard to field trips. It happens that the merit of field trips came up for consideration at each of the meetings I have just attended. It was agreed that they should be planned in advance, executed along some agreed upon line, and summarized and applied after they had been experienced.

In every instance it was agreed that one of the outstanding values of field trips lay in the fact that they were superior to vicarious experiences. Therefore we talked and talked about field trips. It was agreed that they should involve study of the local environment and lead to improvement in making it significant. To help in this we discussed field trips that had been held a thousand miles apart. It was agreed that they should be purposeful, and yet a master teacher spent a half-hour demonstrating how to teach elementary youngsters how to find North. When I left they still had not found it, and at no time do I remember any suggestion as to why one should want to find North, or under what conditions knowing which way North was would be of value, and what should be done if you did find North. It was a master lesson from many angles, but, as will be suggested, it ignored the possibilities of the immediate time and space factors.

Some years ago I had attended a session of one of these same groups. At that earlier meeting some of us had asked the host leadership if a field trip might not be arranged at some time during the program. We were told that it would be impossible because the sewage disposal plant was closed on Saturday afternoon, and, anyway, the drivers were not available on that day for the school buses. The mere fact that the immediate campus had some spectacular examples of slip erosion, of the work of the C.C.C. boys, and of absurd ideas of landscape architects, and splendid examples of how Nature sometimes survives in spite of man, was not considered. So, we abandoned the effort to have a group trip and a few of us took one anyway. Besides we had ridden in school buses and had seen sewage disposal plants before.

Imagine my surprise at my renewed contact with this group to find that the first item brought before the committee to which I was assigned involved the examination by the group of an airplane view of — you guessed it, a sewage disposal plant. This time we did not even need the bus as we had a view from an airplane as it was seen by the camera of someone else. Time marches on, even in field trip techniques. My first suggestion was that the group take a field trip of less than a hundred yards at least some time during the session. The idea was abandoned in favor of more talk. I deliberately proposed, at least once in each of three sessions, that the group take a short field trip no more than a few feet from the building, but each time we substituted talk, and more talk, about field trips. We explored vicariously the waters that fell in the Catskills and finally came to New York, and we even followed those waters out through hydrants along the sidewalks of New York into the gutters and even into the sewers under and beyond the sidewalks. I doubt if any man really ever took such a trip and lived, but we did it, vicariously, and we talked and talked and talked. We did not walk and walk and walk, or even just walk, except on our way across a beautiful campus to delicious meals at least three times.

At no time to my knowledge was any concerted effort made to use that walk as a vehicle for understanding the techniques and unique values of field trips.

After one meal I came out of a building on the south side of the quadrangle with one of the leaders. Since we came out of the north side of the building, and since there was snow and ice on the ground, it seemed a bit cold. The leader turned up his collar and suggested that it might be a severe experience to make the journey of a few yards across the quadrangle. I looked at the sun and suggested that it might not be so uncomfortable after he had moved twenty feet to where the sun shone brightly. He looked at me as though I were a bit crazy, but I noticed that he turned his collar down when he had gone the specified distance.

There were no animal tracks or other signs of wildlife on the north side of the building where we ate, and snow covered the ground continuously there. Across the quadrangle were the windows of the room where for days we discussed field trips. They faced south. Just outside there was no snow on the ground, although snow adjacent to where it had melted was well pocked with tracks of wild birds and of mammals. Three gray squirrels dodged the "blind" teachers as the pedagogues entered the building, and a small flock of juncos flitted unnoticed about some evergreens between the two main entrances. Evidently the wildlife knew something about the relative climatic advantages of a north and a south exposure.

Across the west end of the quadrangle was a large building down the steps of which a path had been shovelled. The bank facing the south was beautifully pocked with melting, while the bank facing north, and naturally in the shade, was as smooth as the new-blown snow. I doubt if any teacher, except the few to whose attention I called these things, noticed them. They were too busy talking and talking and talking to take time to do a little looking. After all, space is vast and time is great so why worry about that present where you happen to be.

After twice having taken this delightful north-south journey across that exceptionally stimulating campus, we at last gathered for a demonstration of how to teach children. We spent a half-hour trying to get a magnetized darning needle to act as a compass so that we could find North, even though we would not know what to do with it after we found it. The children were in the north end of a beautiful auditorium that sunny afternoon trying to make that magnetized needle work. Some of the children had difficulties with the sun shining directly in their eyes while they fooled with the needle, and with books that would presumably help them understand whether what they observed was right or not. When I left to keep an appointment I casually commented to an acquaintance that I wondered why they did not use the sun to help them find North.

In the discussion that followed my departure, my friend asked the leader why he had overlooked this little bit of contributory evidence as to where North was. The answer he got was, "I never thought of it." I have no intention of deprecating the masterly lesson that showed that a magnetized darning needle floating on a cork in a dish of water will behave peculiarly. I am sure the kids had a good time in the front of the room just as I had a good time in the back of the room waiting in vain for someone to recognize the value of an afternoon sunbeam in helping one to find North. I am sure that it took me less than a half-hour to find it by my method, and I needed no special equipment or books to help me do the job. Had the demonstration been any different it would have been out of step with our little group, which continued to discuss indefinitely the merits of field trips in the schoolroom, on the campus and in the immediate vicinity with the help of airplane views of sewage disposal plants. I did not stay to see the crowning glory of this otherwise splendid conference. It consisted, I understand, of a summary of the findings of a group of teachers — who had been working for a few days — made by a man who had not been in attendance except during the last few hours of the meeting. Somehow I felt that, having attended the meetings myself, I could give as good a summary for my needs as could be given by someone who had not been there. I may have been wrong, but by leaving I got home and got a whole day's work done

that would have otherwise contributed to my usual worries about deadlines. I regret missing the opportunity of seeing someone draw summarizing generalizations without the help of supporting data.

I wish that I might tell you the details of one of the other sessions but I just cannot do so. I might mention, however, that I visited a remarkable campus of a teachers' college where one of my former students was teaching. I got some spectacular pictures of spatter, sheet and gully erosion within ten feet of the main building. The campus was rich in biological materials, and the horizon yelled historical geology and physiography at those who had eyes with which to hear such messages. That may sound a bit confused biologically but it is almost exactly what I meant. Maybe I should have said eyes with which to read such messages, but if I had you might not have been challenged by my statement any more than were most of the staff of the college challenged by the opportunities presented by their environment. The most disappointing experience at this meeting was to find that my former student took a field trip with his students to the farthest horizon with the help of the school station wagons, and I am sure he had not exhausted the possibilities of what was near at hand. At any rate he did not sit and talk and talk with and at his students. That was encouraging.

At one of these three recent meetings I was asked to reduce my observations on the field trip aspects of the conference to the fewest possible words. I thought back over the talk and talk and talk, and of the comfort of the huge leather covered chairs in which we sat and talked. It seemed to me that de luxe field trips might be the best name for these journeys through the air, over the ground, out hydrants and down sewers, without any of the offensive sensory experiences or fatalities that might accompany real trips to the places involved. Then it came to me that in six hours of sessions of this particular committee I believe that I was the only member of the group who at any time stood up. I dislike personifying Nature with such names as Mickey Mouse, although I love the little beast. Maybe I should go with the crowd this time, however, and give a catchy name to these de luxe field trips. How would Fanny Field Trip do?

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# Camera Trails

By  
EDNA HOFFMAN EVANS

**F**EBRUARY has never seemed to me to be a very outdoorsy month. Winter is still much too well established and spring seems so far distant. It is much nicer (and more comfortable) to stay indoors, toast one's toes in front of the fire, and dream. It is a good time, too, to go through the negative file and put it in order. Goodness knows, it needs reorganizing.

The slides we took out to enter in the state fair photo contest last fall still need to be returned to their places. So do the assorted negatives we jerked as Christmas card possibilities. And how did this desert shot get mixed in with the beach scenes? Really, it is high time that we refiled those negatives.

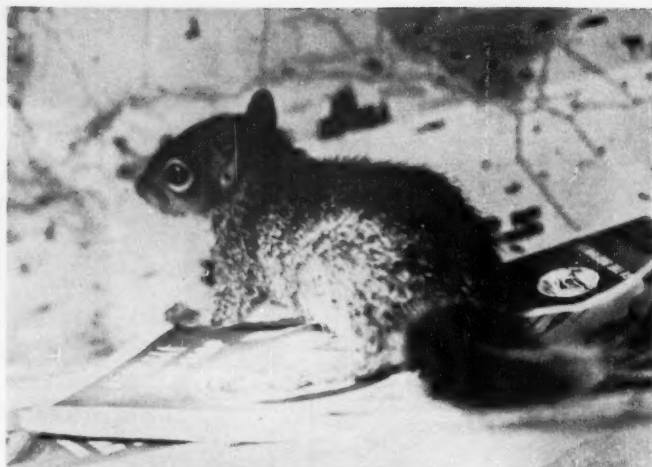
When the most immediate jobs of re-filing have been done, it is pleasant to look through the older negatives. What memories they bring back. And is it not strange how time has sifted out the unpleasantnesses, the discomforts, even the heartbreaks that accompanied the original shooting? Our memories now are pleasant and, bless them, long may they remain so.

Probably no hobbyist has the means to bring back past scenes as well as does the photographer. Collectors of stamps, coins, and the like can look at their collections and remember places and events connected with each item. But the scene, itself, has vanished. Only the photographer can look at his pictures, or negatives, or slides and see the things as they were.

One of my favorite series of negatives shows two coconut palm trees, one tall and one short, poised at the edge of the beach overlooking the waters of the bay. I say it is a series for there are a number of different shots showing various cloud effects in the background. It is a peaceful, beautiful scene and many happy memories cluster around those trees, and the shore, and the bay nearby.

As for the trees themselves — one was frozen a dozen years ago by an unusual winter cold spell. The other died soon thereafter and the very place where they stood has been eroded away by years of waves and storm-driven surf. I walked near the spot a few months ago and noted the changes. Yet, to me, the trees will live as long as the negatives last. I can print pictures from them, hang those pictures on my wall, enjoy, and remember.

Then there are my bird nesting shots. Here is one of a pair of least tern babies that was taken in May of 1939. See, the date is on the envelope. Whatever became of those ternlets? If they grew up to



Gulliver, the squirrel that traveled across the continent before his eyes were open. He was a hurricane refugee.

breed the following year, and their babies bred the following — why, the birds in my picture must be great-great-great-great-great-great-great-grandparents by now!

And yet, as I look at the negative, I can recall how warm and soft and fuzzy they felt as they nestled in the palm of my hand. I can remember how their parents hovered excitedly overhead, uttering their shrill cries of "Eeep! Eeep! Eeep!" In memory, I can feel the hot sun beat down on me, I can recall the intense glare of reflection from the white beach sand. I can almost hear the gentle "wash-wash-wash" of the waves as they lapped against the shore.

Here is my file on Mexico. As I look through it, holding first one negative and then another up to the light, more memories unroll. It is more than just remembering. I can actually see the scenes again. Here are the pictures of the young boys who were glass blowers in Guadalajara. And there is the family that painted tile designs at Tlacquepacque. Their paintings of leaves and flowers and birds, of deer, and rabbits and other animals were beautiful and colorful, despite the fact that not a one of the artists ever had a moment of actual training.

Oh yes, and here are the pictures I took at Lake Patzquaro of the fishermen and their butterfly boats. They are picturesque, although I cannot resist a reminiscent grin as I recall that I had to hand over ten pesos before my model would paddle out and pose a short distance from shore. I had always wondered how those beautiful pictures of Patzquaro fishermen were made. Now I know.

Here is the old fisherman who was mending his nets that day as I wandered through the picturesque (and smelly) streets of Atitlan. He did not like it when I aimed my camera at him, but my Spanish ear was deafer than usual that day.

There are scenes from Oaxaca, from Orizaba, from the Pyramids of the Sun and the Moon, from the Floating Gardens of Xochimilco, from the highway that leads down to Acapulco. There are many memories of warm, color-filled days, and lots of nice sounding names to roll around the tongue on a chilly February day.

And here are the pictures I took that summer in South America. I had almost forgotten about them. Now, as I look them over I remember how every piece of film was cherished, and how I weighed each possible shot before I took it. Those were the immediate post-war days when film was still scarce. I did three countries in South America — from sea level to Andes crest, from Baranquilla to Bogota and Quito and then back to Caracas with just six film packs. My, I hope film never gets that scarce again!

We must not forget the pictures of animal friends. Here is a negative of old Pal, the collie I grew up with. I was just learning to use a camera when I took that picture, and Pal was an old, old friend.

Here is Junie, the first kinkajou I ever knew — he came from Mexico. I remember how I nursed him through a winter and a half of pneumonia before he, a tropical animal, succumbed to temperate zone weather. And here is Coosie — she was a South American kinkajou. Sulfa pulled her through two winters, and after that I decided not to have any more tropical animal pets.

Also from the tropics, and contemporaries of the kinkajous, were the contumundis. There is Big Boy with his long, curious nose, and Thomas with his pertly cocked tail. Big Boy got sick and I had to put him to sleep one day; I would rather not think about that.

This squirrel was named Gulliver. A Florida hurricane blew him out of his nest, and he traveled across the continent with me before ever his eyes were open.



For generations, this boy's family has painted designs for tiles in Mexico.

I fed him via eye dropper and he was an excellent traveler.

Why, here is a series of the Statue of Liberty. I had really forgotten how I carried the camera across New York and aboard the boat that took us for a cruise around the harbor. It was a gray, cloudy day and workmen were making repairs so that all parts of the statue, and the island on which it stands were not open to visitors. I remember worrying about light (or rather, the lack of it) when I took those pictures. Really, they are not so bad. I think I will print a new picture of the Goddess of Liberty next time I have a few minutes to spare in the darkroom.

Then here are some scenes from Washington — the Capitol dome, the spire of the Washington Monument, the Lincoln and Jefferson memorials. As I look at them I remember, too, how many other visitors were aiming cameras at the buildings and monuments. A lot of people have photographic memories of their Washington visits.

Is it not nice, sometimes, just to sit and remember? I would not have recalled half those scenes, events, and friends (both human and animal) if I had not started going through and straightening my negatives. It has been a pleasant, dreamy session, and yet I have accomplished something, too.

Negatives, I think, are more restful to work with than color slides. Maybe it is because the values are soft and soothing. There is no brilliant color, no intense hue to stir one up and inspire him to go forth immediately and take more and better pictures. Yes, negatives are restful. It has been nice to look at them — and to remember.

Try it sometime. It is a pleasant way to spend a chilly February afternoon.

Incidentally, while we are on the subject of negatives, how do you keep yours? Do you take care of them so that they will be usable and in good shape for years?

It is surprising how often people do not realize the importance of their negatives. The prints are all that matter; those funny looking semi-transparent things are of no importance.

Of course an experienced photographer, be he amateur or professional, appreciates the importance of the negatives. They must be kept unscratched and unmarred if they are to be used successfully to print pictures in the future.

If you have not already done so, it will be wise to set up some sort of a filing system for your negatives. Every negative or, at the very least, each few negatives on a single subject, should be kept in some sort of protective cover. It is possible to buy semi-transparent envelopes at most camera supply stores. These are made in various dimensions to fit the different sizes of film. There are long narrow ones to fit three successive negatives from a 35mm roll, and there are other sizes up to 4 x 5 and larger. These nearly transparent envelopes have several good features. First, they protect the negative from dust and scratches. Second, because it is so nearly transparent, such an envelope can be held against the light and the negative viewed through it; there is no need to risk getting fingerprints or scratches on the negative by removing it.

Of late, I have been filing a contact-size print with each negative since, instead of transparent envelopes, I use heavier brown ones. This takes up a little more space, costs more, but in the long run it gives me a better idea of the picture possibilities than the negative by itself. Modifications of this system are used by other photographers. Some mount the contact print on the outside of the protective envelope. That way they can tell at a glance what the contents are. With this system there is only one negative per envelope.

The place you keep your negatives is important, too. It should be dry, and not subject to extremes of heat and cold. Cold tends to make them brittle, while too much heat can cause a negative to buckle or to make the emulsion crack and become "reticulated." That, of course, spoils its printing possibilities.

Dampness does considerable damage to negatives. Nor do they have to be subject to an actual wetting for the damage to result. Of course, if the roof leaks or a flood comes sweeping through the house, damage is bound to occur. But the insidious dampness that creeps into closets and drawers during the course of a moist coastal summer also causes damage.

Take care of your negatives. Look through them every so often. You will be surprised and pleased at the host of pleasant memories such a session can bring back.

There are no trade notes this month. From experience I have learned that camera and photo supply manufacturers take a breather following the Christmas rush. The mail gets very slim after the holiday selling campaigns are over.

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## THE THREE ABUNDANCES

(Continued from page 68)

and more complicated subject as in the fruit basket of the coral figure of Ma Ku.

The same skill that the lapidary used on semi-precious stones, he applied to glass and fabricated snuff bottles that have a cameo-like character. One that was made during the Ch'ien Lung period (A.D. 1736-1795) has a background of cloudy white upon which the three fruits stand out in soft green relief.

Wood and lacquer also provided media that were suitable for the craftsman's abilities. Many beautiful examples of carving may be seen in which the three fruits play their role in the decorations.

Chinese embroidery, likewise, has been notably inclusive in the designs that it has employed, so we shall surely find the *san kuo* in this section of China's artistic attainment if we but keep our eyes open. The three fruits are to be found not only on silks and satins but also in cross-stitch on coarse cotton from the remote interior of the country. Such patterns were used in the past; and today similar designs are on sale for the decoration of embroidered shoes or pillow ends. In a field somewhat akin to embroidery, there are textiles that are brocaded in a wide variety of designs, the three fruits being amongst them.

No matter where the Chinese artist or craftsman has seen fit to utilize the Buddha's hand, the pomegranate, and the peach — whether in porcelain, jade, glass, embroidery, or other medium — he has not made mere representations of fruits that are to be bought in a Chinese market. Rather, he has portrayed, for all who may understand, the symbols of his highest aspirations in life — the Three Abundances.

## HIGHLAND TREES AND JUNGLE MAGIC

(Continued from page 95)

crown of deep green foliage, which, when struck by sunlight and wind, shimmers with a peculiar whitish gleam. The proportions are so balanced that they are huge without being in the least grotesque. Among hundreds of species, one can distinguish the mahogany almost at a glance.

The Spanish were in Peru more than a century before they discovered the life-saving cinchona tree; but they had hardly arrived in Hispaniola before they were using mahogany wood. In the cathedral of Santo Domingo are carved specimens upon which time has made no dent since 1514. Cabinet makers never exhaust the rich, unfathomable beauty of the grain nor the variety of design into which it can be turned.

The search for this premier of all woods has thus had a long history in Central America but is just beginning in the Amazon. The trouble and patience re-

quired to log mahogany cannot be expended upon other species. As a result there comes about a lowering in the quality of the forest as the one exploitable species is removed. Although mahogany is a good seeder and a rapid grower, it cannot maintain itself against rising demands and more thorough methods of exploitation.

Two obvious steps for Bolivia and other countries possessing this valuable wood should be to set aside reserves where it can be seen and studied in a natural state; and to encourage through research and promotion, the use of other species.

Were the problems of conservation that face Bolivia of import to her alone, their interest and significance would be less. The fact is that the hardwood forests of all the tropics are the world's last great forest reserve and many are being subjected to much the same abuse given now vanished reserves. Yet they form a heritage too rich to be frittered away through lack of attention and study.

Bolivia is fortunate in that exploitation has not gone so far but that a policy of conservation and renewal could be enforced before irreparable harm is done. We can only hope that the government will take note of what has already happened and prepare now for a better future.

## LIGHT-TIME AND CELESTIAL DISTANCES

(Continued from page 100)

Andromeda, visible to us without telescopic aid as a faint, luminous spot. Its distance is now estimated to be nearly 800,000 light years, and its diameter around 65,000 light years. This would mean that it is a galaxy smaller than our own Milky Way system.

These interstellar distances and intergalactic distances are so great as to be almost beyond our comprehension. We started with a very close celestial object, our own satellite, the Moon. The sunlight reflected from its surface enters our eyes less than a second and a half later. Rays of sunlight leaving the surface of the sun will not enter our eyes until approximately eight and a third minutes later. They will take five and a half hours, about, to travel from the sun to Pluto, while nearly four and a half years pass by while a ray of light from the nearby star Alpha Centauri bridges the space that separates that star from the earth, and we see it as it was about four and a half years earlier. As the distances that separate us from stars and nebulae in far-away parts of the universe increase, the light that enters our eyes becomes older and has been longer on its way. There is evidence that it is also redder, because of encounters with interstellar dust, which tends to scatter the shorter wave-lengths of light. These objects we observe out among the extragalactic nebulae are very old. We do not know where, or how, they are to-day for we see them as they were

millions of years ago, even two or three hundred or more million years ago. When one looks at the outburst of a supernova in the *nearest* of the great extragalactic nebulae one is witnessing an event that happened nearly 800,000 years ago. We study the heavens not as they are today but always as they were in the more or less distant past.

On the evening of February 10, E.S.T., there will be a very small partial eclipse of the moon, less than a tenth of the diameter of the moon covered by the earth's shadow at time of greatest eclipse. This will occur at about 7:40 P.M. on February 10, E.S.T. This eclipse will be visible at Washington, D. C., and all over North America, except the western and northwestern parts, in South America, and Asia, Europe, and Africa.

On February 25 there will be a total eclipse of the sun. The path of total phase will begin in the Atlantic Ocean near the equator, pass northeasterly over equatorial Africa to Khartoum and Port Sudan, and over the Red Sea to Arabia, the Soviet Union, and Central Asia. Partial phases of the eclipse will be visible over Europe, Africa, except the extreme southern part, and all of Asia, except the eastern and southeastern part. The longest duration of totality will be about 189 seconds, occurring near the Red Sea about noon.

Among the planets in February Mercury will be in superior conjunction with the sun on February 21 and too near the sun to be seen all the month. Venus will be a brilliant Morning Star in February. Mars is now rising before midnight and is in Libra. It appears as a brilliant, reddish, object. The planet now is increasing rapidly in brightness, rivaling Capella and Vega in brilliancy by the end of the month. Jupiter is in the western evening sky in Pisces and is a beautiful Evening Star. Saturn is a few degrees northwest of Spica in Virgo, rising late in the evening. It is now brighter than Spica.

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## THOMAS PENNANT

(Continued from page 98)

specimens to be held against his coming. Books on these journeys ran through five editions and caused Scotland to be inundated with visitors from the south — a movement that has never since ceased.

A *Tour of Wales* (his native province) was issued in two editions during his lifetime and was twice reprinted thereafter. A *Journey from Chester to London* was published, as well as a guide-book of London, which continued through five editions and was adopted as "official." James Boswell referred to it as "one of the most pleasing topographical performances that ever appeared in any language."

He left in manuscript, accounts of three other tours, one to the Isle of Wight and two in England; these were published by his son David. The number and effectiveness of his travel books would seem sufficient to entitle him to recognition as a forerunner of John Murray and Karl Baedeker, whose manuals for travelers made them famous.

Pennant was born, lived, and died as one of the landed gentry and always had enough means to gratify his tastes and to finance his publications. Apparently he broke even or made money on all but one of them. That was the first edition of *The British Zoology*, a quarto with colored plates, of which he remarked, "I... was ill-advised to publish on such large paper."

He was usually accompanied on his trips by one or more companions whose expenses he paid. On the second Scottish tour (1772), one fellow-traveler was a botanist whose *Flora Scotica* was later published under Pennant's sponsorship. From that journey onward, a constant employee was Moses Griffith, artist and engraver, whose labors were largely responsible for the more than 800 illustrations that embellished the works of his patron.

Thomas Pennant was born, maintained his lifelong home, and died, at Downing in the northeasternmost shire of Wales. When a boy of twelve, he was given a copy of Francis Willughby's *Ornithology*, to which he later attributed his taste for that science and, indeed, for natural history in general. He was educated at local schools and matriculated at Oxford University. Although he remained there the requisite period as an undergraduate, he took no degree. During this college period, he made a journey to Cornwall where Dr. William Borlase encouraged him in the study of minerals and fossils. His first publication dealt with an earthquake that was felt in his home region in 1750.

In 1755 he began a correspondence with Linnaeus, which led to his election (1757) to membership in the Royal Society of Uppsala, which he esteemed as the greatest of his literary honors. On the continental tour (1765), he visited the famous Count de Buffon and was entertained at his country seat. He met numerous other naturalists, including Peter Simon Pallas.

This was a fructifying experience that gave rise to his *Synopsis of the Quadrupeds*. In 1767, he was elected a Fellow of the Royal Society, and in 1771 received the honorary degree, Doctor of Civil Law, from Oxford. On his second tour of Scotland in 1772, he was given the freedom of the city of Edinburgh. In the record of his literary life and works, he expressed his appreciation of election to the American Philosophical Society and of the friendship of Doctor Benjamin S. Barton of that organization.

Pennant experienced the gratification, so much appreciated by naturalists, of having his name commemorated in scientific nomenclature. A genus of plants of the Australian region was named *Pennantia* in 1776, and the large North American weasel or fisher was designated *Mustela pennanti* in 1777. In all about thirty species of animals have been dedicated to Pennant, including mammals, birds, reptiles, fishes and mollusks.

After his touring days were over, he planned a work of several volumes to be called *Outlines of the Globe*. In his lifetime, the parts on India and Ceylon were published and after his death two on China and Japan were printed. About 1794 his health and spirits began to fail, but he continued literary work and in 1796 published *The History of the Parishes of Whitford and Holywell* (his home region). He died at Downing in his 73rd year and was buried in the Church of St. Mary at Whitford, where a monument to him was erected.

Thomas Pennant's name stands high among naturalists of the 18th Century and his writings have been commended for making dry, technical matter interesting. His literary industry was immense, yet he found time for the duties of a country gentleman, a member of the militia, and of High Sheriff of Flintshire for a term. The redoubtable Samuel Johnson, who would express an opinion on anything, said of him, "He's a Whig, sir; a sad dog," but Pennant described himself as "a moderate Tory."

So long as English literature is esteemed, the name of Gilbert White will be remembered, but with his fame inseparably goes that of Thomas Pennant to whom were addressed 44 of the 110 letters that compose "The Natural History of Selborne." Pennant had a long and enviable career but made good use of his favorable circumstances and labored for the advancement of knowledge in a way not often emulated by members of the independent class.

### The Birds Are Yours

*The Birds Are Yours*. By Robert S. Lemmon and Don Eckelberry. New York. 1951. The Macmillan Company. 121 pages. Illustrated by Don Eckelberry. \$2.25.

This attractive and most readable little book deals with events in the lives of birds

that are not widely known or often observed. Forty-four short chapters cover a wide variety of subjects, and forty-four illustrations in black and white point up the interesting information. Bird enthusiasts of all ages should enjoy this little book, although it is especially appealing to young people.

### Havasu Canyon

Another series of trips to Havasu Canyon within Grand Canyon National Park are being organized by Joseph C. Wampler, archaeologist-mountaineer, of 1940 Hearst Avenue, Berkeley 9, California. Each is an eight-day trip from San Francisco or Los Angeles. A combination of rail and bus transportation is used to Hualapai Hilltop, Arizona. The remaining ten miles of trail to a wilderness camp is afoot or horseback. The first group leaves March 28 and some ten trips are planned. Full details may be obtained from Mr. Wampler.

### Animal Welfare

The Animal Welfare Institute is a new, non-profit, membership organization whose primary function will be factfinding and information-dispersing regarding the controversial question of the use of animals for research in laboratories. The Institute will seek to prevent suffering to animals in the laboratory phase of medical research, and will endeavor to promote the welfare of all animals. Its President is Christine Stevens, of Ann Arbor, Michigan.

Mrs. Stevens has been active in humane programs in her home state, and currently is Chairman of the Shelter Committee of the Humane Society of Washtenaw County at Ann Arbor, which operates a new \$100,000 Animal Shelter there. According to Mrs. Stevens, the Animal Welfare Institute will "seek to function with a solid background of fact as a clearing house for information on animal welfare, especially the use of animals in laboratories," and that while the Institute is interested in every phase of animal welfare, it will at present concern itself primarily with humane safeguards in the use of animals for research and medicine."

Executive and information offices of the Institute have been established at 730 Fifth Avenue, New York 19, N. Y.

### Protects Hawks

Until recently a "backward State" so far as recognition of the value of hawks is concerned, Connecticut now moves to the front rank through enactment of legislation amending the game laws and extending protection to all hawks. This blanket protection takes cognizance of the fact that the majority of people do not know one hawk from another, and that many think all hawks are bad, so shoot all regardless. Farmers may shoot the birds if they are caught in the act of taking poultry. Sparkplug of the movement for hawk protection in Connecticut was Mrs. Henry Long of Westport.

## Arizona Birds

*Arizona and Its Bird-life.* By Herbert Brandt. Cleveland, Ohio. 1951. The Bird Research Foundation. 872 pages. Illustrated by 20 color plates by Brooks, Peterson, Sutton and Shortt; 25 halftone photographs; numerous pen and ink sketches. End piece maps. \$10.00.

The word unique, in this day and time, has been subjected to so much misuse that one all but unconsciously avoids it. None the less, its correct application is still the only real means of expressing what one desires to point out as something definitely apart. Therefore, in any appraisal, cursory or detailed, of the sumptuous mine of information which is *Arizona and Its Bird-life*, use of the term unique is mandatory.

One is advised, on the flap of the attractive jacket, to "read this book, then go to Arizona." This reviewer is rather glad that he has been to Arizona and is now able to read the book—to vastly increased satisfaction and profit! However, the above advice is perfectly logical, for the volume is an accurate guide as to where to look for whatever the searcher is looking for in birds, in that truly amazing State. Long a mecca for bird watchers, it will doubtless become more so now. To those who have seen something of the fascination so ably portrayed, it awakens a strong nostalgia—in this reviewer, of a day on the slopes of Mt. Graham, the king of the Pinalenos, when he saw his first red-faced warblers flitting through the pines, with the blue line of the Chiricahua in the distance; of a Merriam's turkey strolling along the road shoulder at 8600 feet; of bridled titmice in Oak Creek Canyon and clapping-winged band-tailed pigeons in strong flight over the Ponderosas.

The introductory chapters present Arizona to the reader in a way never done before. The author's "Island Concept" of life zones is an original and highly interesting idea, clearly worked out in a sort of combination, as he says, of the two major held schools of thought regarding the ecological distribution of birds.

The striking chart, between Pages 24-25 illustrates this idea vividly. Evidently fascinated by the desert, as who, indeed, could fail to be, the author has a chapter on it, as well as other physical divisions of characteristic topography. Arizona, as he so well points out, rises from waterless aridity to shiveringly moist heights, and, in the transition, bears remarkable avian fruit.

The body of the text is taken up with his experiences in various ecological regions, with various characteristic birdlife. The determination of study and patience of thought and search, is evident in line after line, page after page. Always intensely interested in oology, the author's success in finding the homes of birds must seem phenomenal to anyone to whom the sight of a bird's nest is practically acci-

dental! That this phase of ornithology, sometimes frowned upon as inconsequential, has far-reaching ramifications is shown by the result of the author's studies. What he has done is to produce a convincing treatise on natural science, founded on where birds live and how they reproduce themselves in an ecological niche. Something of the infinite pains resorted to can be visualized by an examination of the sample data sheet of the author's oological collections, shown facing Page 640. This achievement pleases this reviewer particularly because he has sometimes been a bit ridiculed by his contemporaries for his always intense fascination of nests and eggs! He has always maintained that much can be learned from this phase of ornithology and here, indeed, is vindication of a high order.

Two new birds have resulted from the author's field work, the Sahuaro martin and the Apache wren, both of which are commented upon with pardonable pride. His nest hunting has produced several "firsts," among which are those of the spotted screech owl and Richmond becard. Both of these figure in the color plates.

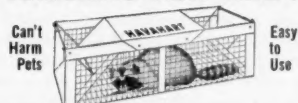
From Page 640 to 708 appears a list of the breeding birds of southeastern Arizona, which should long stand as an authoritative and exhaustive compilation, as well as an accurate guide.

The illustrations are nothing short of superb. Each artist appears to have risen to new heights. There are 20 full color plates, with no margins, and outstanding among them, to this reviewer's mind, are Allan Brooks' red-faced warbler, Arizona junco and the painted redstart; Roger Peterson's band-tailed pigeons and Arizona crested flycatcher; George Sutton's Audubonesque sulphur-bellied flycatchers. The volume contains some of the last work of Allan Brooks, and it is to be doubted whether he could have had a greater monument.

The pen-and-ink sketches are extra touches that go far toward rounding out the beauty of color plates and halftones. An easily read map forms the tail end-piece and a photographic impression of the giant sahuaro cactus, the front.

Surely, here is a volume to take high place on ornithological bookshelves and which has much of the new and the little known in its many page.—ALEXANDER SPRUNT, JR.

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# UNDER THE MICROSCOPE

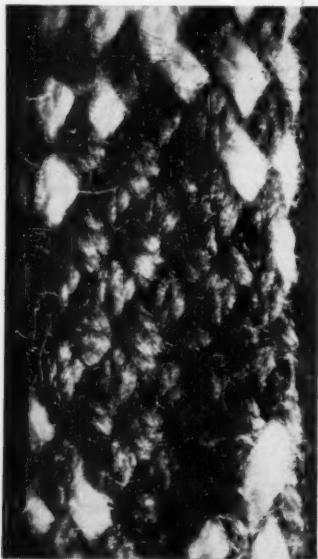
By JULIAN D. CORRINGTON

## UNWOVEN FABRICS

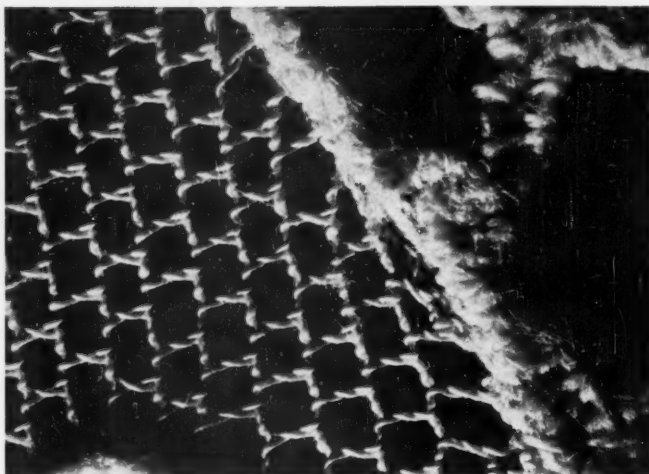
**T**HE textile industry recognizes six types of fabric on a basis of method of joining the threads. Three of these — weaving, felting, and hosiery — were described in *Warp and Weft*, in this department for May, 1951, and three others remain to be considered — plaited, net, and lace fabrics.

A piece of goods that is *plaited* differs from other types in that there is only one series of threads that are interlaced, and these are not at right angles to one another. Of all forms of textile manipulation, this one has been performed by more people than all others combined, for most women have braided their hair, and the small boy does not live who has not boondoggled a plaited cord out of grass, straw, string, or rawhide. Straw hats are commonly made in this manner, as also rugs and matting. Handles of such items as handbags, and dress trimmings may be plaited. Braid as a noun is a frequent term for this kind of embellishment.

The English word for this style of fabrication has not been able to make up its mind how it wishes to be pronounced. In England it is spoken as *plat*, to rhyme with *flat*, and, in fact, may be spelled that way, too, without the *i*, when used as a verb. In the United States it has been *plait*, rhyming with *plate*, but is now more often heard as *pleat*. If you were writing to a friend, describing a costume, would



Detail of plaiting, 9X



Portion of lace work, 25X

you write box plait or box pleat? Webster will back you up on either word, but not on *plat* as a noun, regarded now as obsolete.

Net and lace fabrics are openwork, as opposed to the usually compact body of other types. In *nets*, wherever threads cross they are tied by knots, and thus held

and woven designs that make them qualify technically as a lace.

The ability to construct a presentable net by hand calls for skill and experience far beyond that required in simple weaving or plaiting. Many have been the machines and parts invented to manufacture nets, some successful, but all complicated. Wire netting, as chicken wire, employs the twisting part of net technique, but has no knots.

*Lace* is quite a different sort of fabric from all others, and stresses beauty and pattern. Some sort of geometrical, flowery, or pictorial design is implicit in lace making, which becomes much more involved than other fabrications and constitutes the real class of textile manufacture.

Three methods of lace making are in use; point lace and pillow lace are made by hand, and machine lace may imitate either. In *point* or *needlepoint* work a pattern is first drawn on parchment, which is then sewed to two pieces of linen. A framework for the lace pattern is now made by placing threads over the parchment design and stitching these to the parchment and linen backing. After the framework is converted into the finished work or lace, the parchment is cut loose by severing the stitching between the two linen pieces. In *pillow-made* lace, the parchment pattern is pricked with holes that determine where the guiding pins shall be stuck. Then the pricked pattern is fastened to a pillow, the threads hanging across the work from bobbins. Pillow lace is softer, point lace crisper. *Machine lace* copies both types, with varying degrees of success according to the complexity of the setup and the skill in punching the master cards that operate the mechanism that moves each thread.

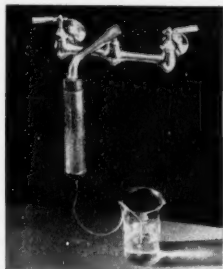
The procedure, in any case, is a combination of the other methods. At places the fabric is made up by two, three, or more threads that are merely twisted;



Detail of net structure 3X

in place so as to preserve the designated pattern. Such materials as fish nets, tennis nets, and hair nets are familiar applications of this method, but not everything so called is real netting. A butterfly net, for example, is more apt to be open weaving or a lace groundwork. Malines is a fine silk mesh used in millinery and dressmaking; tulle is the more recent term, both names from French cities. While providing the appearance of a netted fabric, these are not true examples of netting in that the intersections are not knotted. Veils are of many patterns, some netted, some with complex twisted

elsewhere they may be looped or secured with a buttonhole stitch. At still other places they may be plaited or netted or woven. Hence the labor in lace making is more varied and intricate than with other fabrics. Since the Fifteenth Century various centers of lace making have become notable from time to time and their product bears their name in varying degrees of fame, as Brussels, Irish, Alençon (point), Valenciennes (pillow), and many others. But even the finest of laces may be expected to appear as a series of coarse ropes when magnified, as is the case with our illustration.



#### PURE WATER SOURCE

**T**he accompanying illustration shows a small gadget made to attach to the cold water faucet, and designed expressly to deliver the equivalent of distilled water in small amounts for users who do not need large quantities. This seems to be the answer to the amateur microscopist's prayer, for the cost of the LaMotte Filtr-Ion Unit is only \$3.85. It is ready to install by means of an elastic cap fitting, and will deliver up to ten gallons of chemically pure water, of the quality of triple distilled water, with a pH of about 7.0. The exact amount produced depends upon the mineral content of the raw water used.

Exhaustion of the unit is indicated by a complete color change affecting the entire column of resin. The unit is then serviced with the standard refill unit containing sufficient resin and filters for two rechargings, the refill costing \$3.50.

The Filtr-Ion Unit was developed by the LaMotte Chemical Products Company of Towson, a suburb of Baltimore, with the cooperation of the Rohm and Haas Company, manufacturers of "Amberlite" resins. Its performance employs their mono-bed deionization process, which is very efficient in removing the ionic solids in water. This system does not take out the non-ionic substances, such as alcohols, ethers, and bacteria, and accordingly the water produced is intended for external use only and should not be taken internally.

This unit will be found of great utility in providing chemically pure water for batteries, photography, electric steam irons, hydrogen-ion studies and, above all as our interests go, the private microscopist's laboratory. Those interested should order from the Will Corporation, Rochester 3, N.Y.

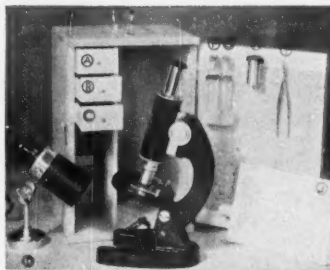
#### HISTORICAL OUTLINE

**A**N IMPORTANT personality in the period when parasitology was shaping up into an independent science was the German zoologist and physiologist, Karl Ernst von Siebold (1804-1885). He was born in Würzburg and studied at the universities of Göttingen and Berlin. Beginning in 1840 he occupied successively professorships at Königsberg, Erlangen, Freiburg, Breslau, and, in 1853, became professor of physiology and comparative anatomy, later also of zoology, and director of the collections, at Munich.

Siebold performed many valuable services for the zoology of his day. Locy said of him, "There arose a strong man in zoological science." With Friedrich Stannius he published a textbook of comparative anatomy (1845-48), taking the invertebrates as his portion of the task, Stannius doing the vertebrates, while with Rudolf Kölliker, the Swiss microscopist, he established the celebrated Journal of Scientific Zoology (*Zeitschrift für wissenschaftliche Zoologie*).

Animal classification had come to be dominated by the type system proposed by Cuvier, according to which all animals were grouped into four branches, the vertebrate, articulate, molluscan, and radiate. Siebold split up Cuvier's hodgepodge *Radiata*, using the name *Protozoa*, first sponsored by Goldfuss, for all unicellular forms, and coining the term *Zoöphyta* (animal-plant) for all multicellular radiate animals, including those separated today into three phyla — sponges, coelenterates, and echinoderms. Further, he divided Cuvier's *Articulata* into two assemblies, proposing the name *Arthropoda* for all joint-legged invertebrates, as crustacea, insects, spiders, and others, and going back to Linnaeus' designation *Vermes* for all the worm groups. Thus, in Siebold's scheme of classification, the animal kingdom comprised six primary divisions: Protozoa, Zoöphyta, Vermes, Arthropoda, Mollusca, and Vertebrata. While destined to undergo considerable further alteration, this arrangement, based on comparative anatomy, was a major step in the right direction. His text has been acclaimed as a great improvement on any preceding work and a model for university teaching purposes; its translation into English gained for Siebold a wide following in England and the United States.

Unlike most of his forerunners, Siebold did not neglect microscopic or minute animals, including the smaller parasites. He authored the name *Rhizopoda* (1845) for the Class of protozoans containing *Amoeba* and *Endamoeba*; the term *Sarcodina* is now current, with *Rhizopoda* demoted to the rank of a Subclass. He named the Class (or Subclass) *Gordiacea*, containing the "horsehair snakes" (1848), the larvae of which are insect parasites, the genus *Syngamus* or gape-worms (1836) and, in the field of human parasitology, Vol. 4 of his *Zeitschrift*, 1852, carried his article *Ein Beitrag zur Helminthographia humana*, with the original naming and



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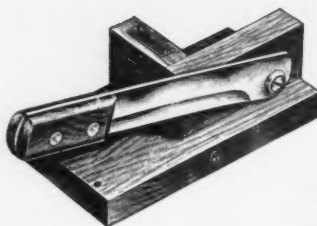
description of two human helminths unknown to earlier workers, and both discovered by Bilharz in 1851 from autopsies in Cairo. These were *Distoma heterophyes*, now called *Heterophyes heterophyes*, a minute intestinal fluke of cat, dog, fox, and man, in Egypt, the Near East, and Far East, and *Taenia nana*, now called *Hymenolepis nana*, the cosmopolitan dwarf tapeworm. In 1856 he published a dissertation on parthenogenesis.

Siebold rejected the idea, fostered by Ehrenberg, that the parts of the complex cell of most ciliates correspond to organs of higher animals, such that the cilia represent hair, the vacuoles and their radiating canals are the digestive system, the nuclei are sex organs, and so on. Siebold said the entire body of such an animal is still just a single cell, and he classed the rhizopods and ciliates together as Protozoa, divesting this group of such microscopic but multicellular creatures as rotifers and cercariae, and of such minute algae as *Volvox*. This assertion not only strengthened zoology, but also the cell principle, at that time struggling to make headway.

His crowning achievement was, however, a major contribution to the development of parasitology. Influenced by studies he had made of fishes and certain birds that eat fishes, he deduced that an alternation of hosts might be a necessary corollary of Steenstrup's alternation of generations and, in 1848, made the statement that bladderworms or cysticerci were larval tapeworms. While not the first, in strict chronology, to put this idea to the test of experiment (Kuchenmeister, 1851), he was close on the first man's heels when, in 1852, he fed the echinococcus larvae found in cattle to dogs and in three weeks recovered many of the small adult tapeworms from the intestinal lining of the carnivore. Two years later, in 1854, Siebold published his *Ueber die Band- und Blasen-würmer*, or Tapeworms and Bladderworms, a cornerstone treatise. At this time the adults were called tapeworms (bandworms in German) while the larvae were designated as bladderworms, the two phases of the life cycle of a single animal being considered as two distinct animals, even to placement in separate divisions in classification. The discovery that tapeworms found in the bodies of higher animals did not arise anew but resulted from ingestion of bladderworms was to prove a major blow to that ancient but durable doctrine, spontaneous generation.

#### PARAFFIN BLOCK TRIMMER

A SIMPLE and efficient device for trimming paraffin blocks down to suitable size and shape for sectioning on the microtome, as the worker gets ready to mount the tissue block preliminary to cutting, has now been placed on the market. The trimmer was designed by Martha Conger, Chief Technician of the Genesee Laboratory, Batavia, New York. At the war's end, as the load at this laboratory increased, Miss Conger enlisted the



aid of her father, Nathaniel Conger, and they proceeded to work out this time-saving implement.

The Conger Tissue Block Trimmer is of high cutlery steel with a special bevel to insure a perfectly straight and vertical cut. It saves time and protects the hands, and is priced at \$5.00. Those interested should specify number 19671 and order from the Will Corporation, Rochester 3, N. Y.

#### DEVELOP GLASS "DOG-TAG" THAT MEASURES EXTENT OF EXPOSURE TO ATOMIC RADIATION

A SUPER-SENSITIVE type of glass that can be worn like a GI "dog-tag" has been discovered to be a reliable, precise detector of atomic radiation. Measuring about one-inch square, the glass "dosimeter" is being developed by U. S. Navy scientists with the assistance of chemists at Bausch & Lomb Optical Company here.

When exposed to high energy radiation — commonly called X and Gamma rays — the clear, colorless glass, which contains appreciable quantities of dissolved silver, remains unchanged in appearance under ordinary light, but reveals the extent of exposure by the amount of orange fluorescence it emits when viewed under "black-light" (ultra-violet). As a result, precise treatment, depending on the degree of exposure, can be prescribed immediately or weeks after exposure to the rays, the optical company announced.

Extremely sensitive to even small amounts of radiation — as low as 10 Roentgens, which is far below the exposure level that is normally considered dangerous from a health standpoint — the glass-type dosimeter lends itself to mass production and is economical to make.

Bausch & Lomb and the Navy also revealed that other types of dosimeters are being developed. The name dosimeter is given such devices in that they measure "dosage" — the medical term for the amount of medicine or poison.

The basic discovery was made by Dr. James H. Schulman, Robert J. Ginther and Lyle W. Evans, of the Naval Research Laboratory. Glass technological and engineering factors were evaluated and the preparation of the glass was started by Dr. Norbert J. Kreidl, of Bausch & Lomb's Chemical Research Laboratory, which specializes in the synthesis of numerous types of optical glass of unusual composition. Background research in the use of

silver in glass was performed by Dr. Woldemar A. Weyl, of Pennsylvania State College, who has served for many years as a government and Bausch & Lomb consultant.

A large number of test dosimeters produced by Bausch & Lomb were subjected to comprehensive field radiation tests conducted by the Navy's Bureau of Ships.

#### BIOLOGICAL LABORATORY MANUALS IX - General Courses

##### Botany

THE many good features we noted in *General Botany Laboratory Book*, by Palmquist (Missouri) and Petry (Cornell), reviewed in this department for February, 1950, have been retained in the second edition. Apropos of the many letters of helpful criticism received, the authors say: "Our primary purpose in preparing a new edition was to incorporate into the Laboratory Book the best material in the pool of suggestions that we considered consistent with our original objectives." There are new photomicrographs, new experiments on seed germination, a key to summer as well as to winter trees, and revisions of mitosis and meiosis, diffusion, and genetics.

The volume is notebook size, wire binding and loose leaf to lie flat, and is not too thick. There are 35 work periods, readily cut in half for a one-semester course. Questions and experiments are well chosen and the illustrations are very good. An excellent teaching manual; — accurate, thorough, splendidly written and printed. Pp. vii, 190; 73 figs. W. B. Saunders Co., West Washington Square, Philadelphia 5, 1951. \$3.00.

##### Zoology

THE second edition of Tracy Storer's *Laboratory Manual for General Zoology* has been altered to conform with the second edition of the author's well-known text, *General Zoology*. Some changes have also been incorporated that laboratory experience has shown to be desirable. Here is a bound volume of the older style of appearance but modern in presentation and format. A set of very complete and exact laboratory directions, rather than a work book, Storer's manual covers general animal biology with the frog for structure and function, then goes through cytology and embryology, genetics, ecology, and adaptation. There follows an exercise on taxonomy, with an illustrated key to the phyla and classes of the animal kingdom. Part II is a survey, from amoeba to amphioxus.

The book is suited for either one or two semesters. The directions are concise but ample, accurate and stimulating. Based on structure, there are many excursions into other fields as well, including the experimental. The student is required to make a large number of drawings, without crutches, and to answer many questions. He is certainly going to know some zoology after he has finished this discipline. Pp. viii, 150; figs. 20. McGraw-Hill Book Co., Inc., 330 West 42d St., New York 18, 1951. \$2.00.

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THE LONG AUGUST NIGHT WAS HOT—and not as hot as the bitter fighting that raged about Agori, Korea, in the Nakdong River area. Sergeant Kouma, serving as tank commander, was covering the withdrawal of infantry units from the front. Discovering that his tank was the only obstacle in the path of an enemy breakthrough, Sergeant Kouma waged a furious



nine-hour battle, running an eight-mile gauntlet through enemy lines. He finally withdrew to friendly lines, but not until after his ammunition was exhausted and he had left 250 enemy dead behind him. Even then, although wounded twice, he attempted to resupply his tank and return to the fighting.

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